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ENGINEERING AND MINING JOURNAL-PRESS

A CONSOLIDATION OF ENGINEERING AND MINING JOURNAL AND MINING AND SCIENTIFIC PRESS

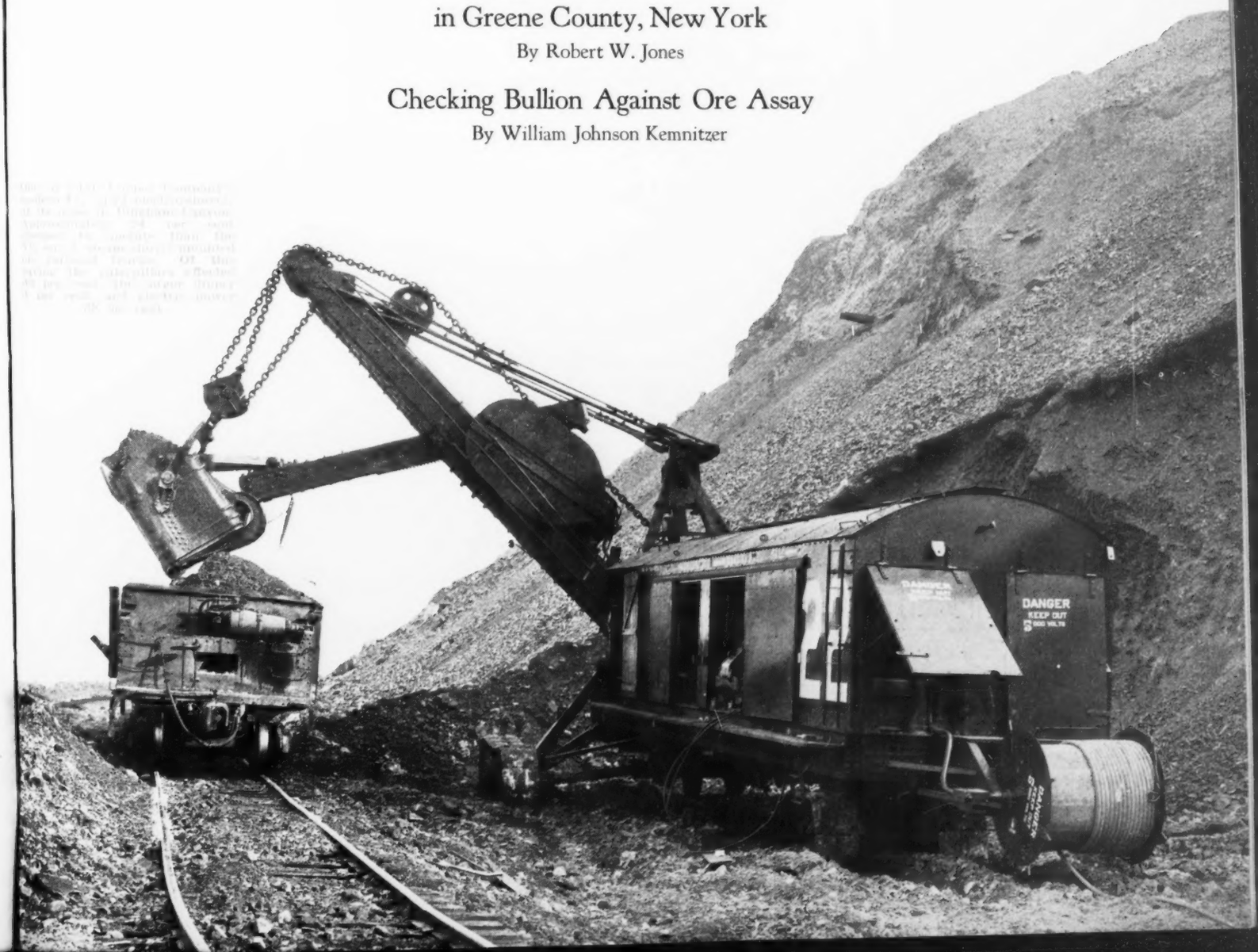
The Andean Salares
By James E. Harding

A Possible New Lead Ore Area in Missouri
By Karl L. Kithil

Hydraulic Mining in California — Its Status

Limestone for Portland Cement in Greene County, New York
By Robert W. Jones

Checking Bullion Against Ore Assay
By William Johnson Kemnitzer



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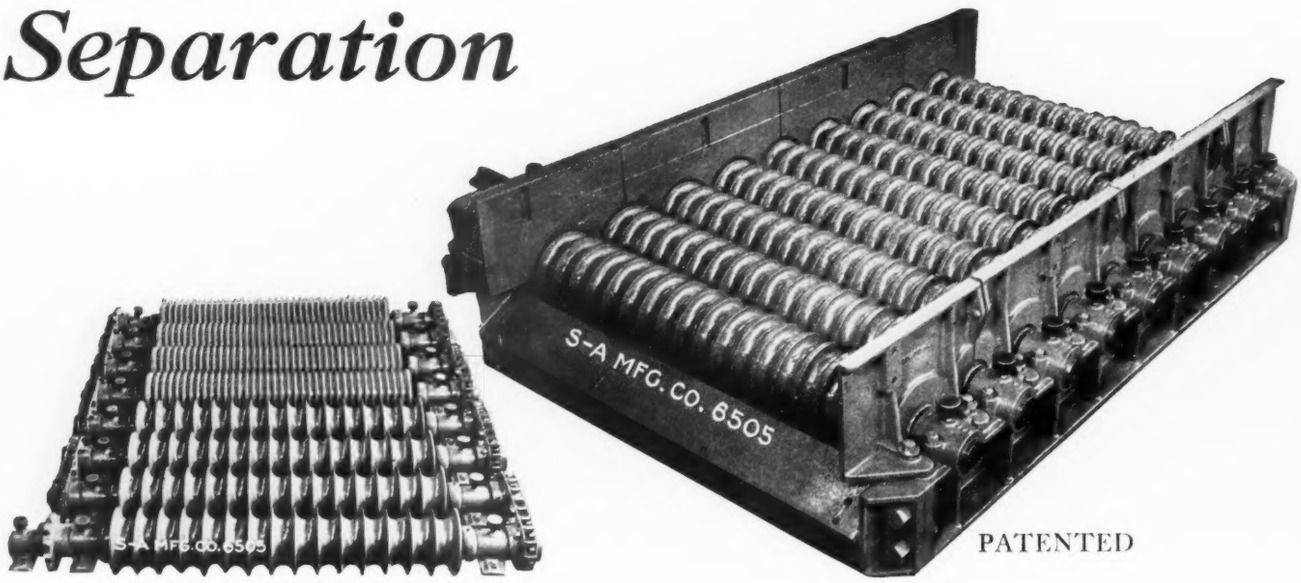

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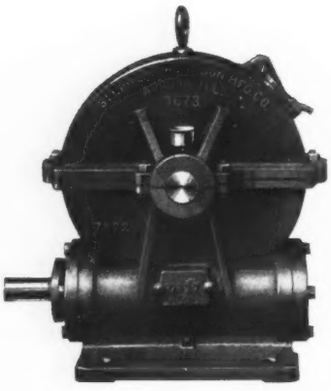

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Volume 121 New York, May 15, 1926 *Number* 20

ENGINEERING AND MINING JOURNAL-PRESS

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The Cincinnati Convention May 24-28

MANY metal-mining men will no doubt attend the Coal Mining Convention to be held in Cincinnati the week of May 24.

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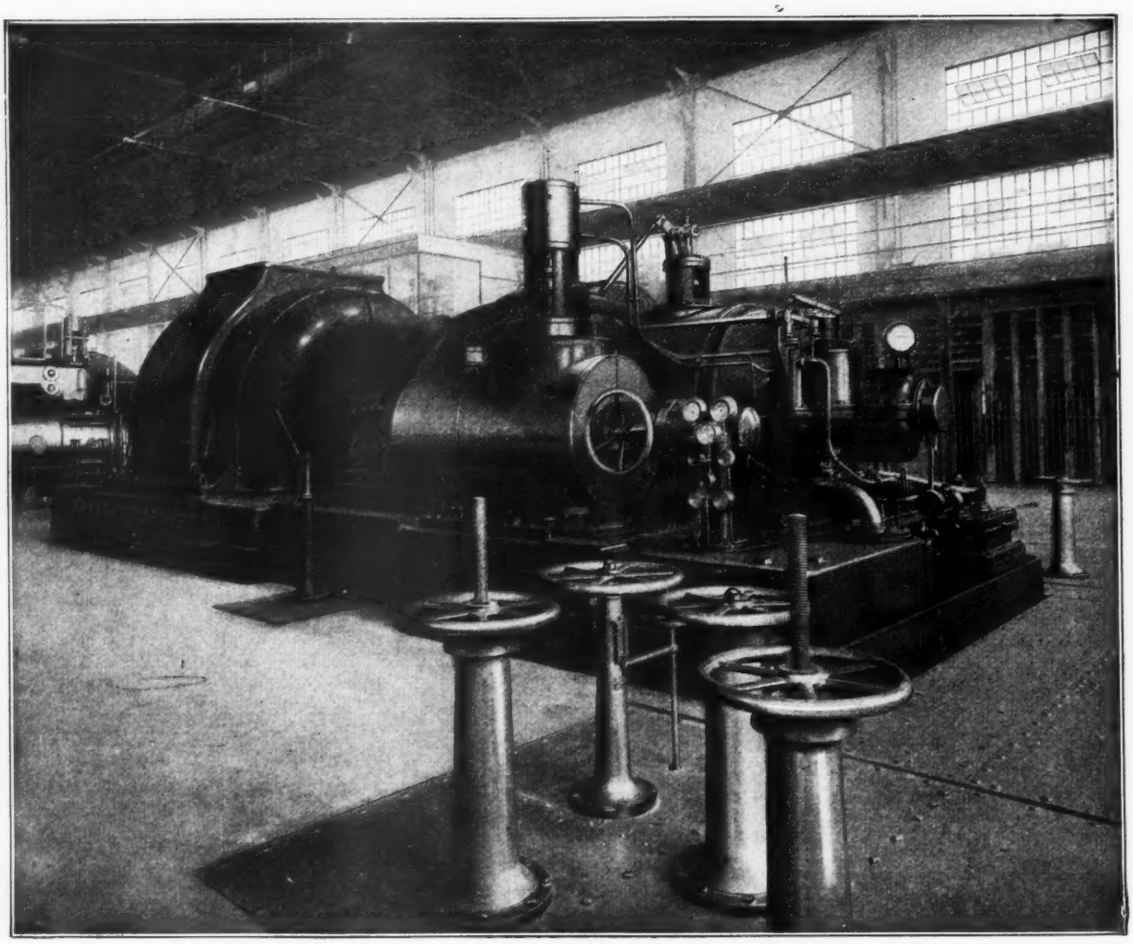

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ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

Volume 121 New York, May 15, 1926 *Number* 20

Decline in Silver Prices

FOR SEVEN MONTHS the price of silver has been declining steadily. The average quotation in September was 71.570c., against only 64.409c. in April. Part of this decline of almost exactly 10 per cent may reasonably be attributed to the lowering of the general commodity price level as reckoned in terms of the gold dollar. But the index number declined from 159.4 to 150.9, or only 5.3 per cent; so evidently other influences have helped to depress the silver market. One factor is the persistent disinclination of many of the Continental European countries to use silver as the metal for coinage. Much was expected in this direction by silver producers a year ago, but results to date are disappointing. The virtues of silver as the ideal metal for coinage have been seriously challenged, and tokens of cheaper substances, including nickel, aluminum, and paper, are being used generally instead of silver pieces. Although there is a good argument for the use of a metal of greater intrinsic value, many question whether silver ever again will occupy the place it held before the war in the currency systems of countries on the Continent of Europe.

This, however, is not the dominant factor in the silver situation. Any discussion of the silver market necessarily involves China and India, which for years have been absorbing the bulk of the world's production. Silver doubtless will continue to flow to the Oriental countries so long as the balance of trade remains in their favor; this favorable trade balance, in turn, will persist so long as the prices of many Occidental commodities appear to be prohibitive to buyers in India and China. The very fact that so many hundreds of millions of ounces of silver have gone into the Orient, where much of it is hoarded as money or elaborate jewelry, suggests the potentiality of a possible reversal of the flow. In the opinion of the London *Statist* this is a threat that would materialize only in time of great adversity or of political disturbances sufficiently serious to endanger the rights of private property: there have been indications of such a tendency in the recent offerings of silver on Chinese account. These, obviously, have been a contributing influence to the price decline. The London paper also suggests that American producers would fare better if they would "utilize the highly organized and perfected mechanism of the London bullion market to a greater extent than has been their wont in recent years." It is argued that the shrewd Chinese and Indian buyers can manipulate the market more easily when shipments are made directly from New York and San Francisco to the East. The implication that the London brokers and their clients are less shrewd speculators and less skillful manipulators than the Orientals is not charitable!

The facts seem to be: whereas production is being maintained at a level higher than any in the last fifteen years, consumption for coinage is much less, the quantity used in arts and industry is gradually increasing, and the situation in China is sufficiently unsettled to disturb the flow to that country.

Making the Iron-ore Operator Pay

THE SUSPICION EXISTS that in some places at least on the Mesabi Range the iron-mining companies are looked upon as shining marks—not to say easy ones—by a certain part of the population, especially the portion that has little or no stake in iron mining. Many of those who depend upon the operators for their employment or upon the existence of the industry for the trade that comes to them are surprising at times in their evident lack of sympathy for the companies. The amounts paid annually by the operators in taxes tend to make one gasp. In the single year 1925, for instance, those companies with property within the limits of the village of Hibbing alone paid over $4,500,000 in taxes on that property, of which $1,500,000 or so went into the village treasury. With such sums coming in every year, extravagance frequently marks municipal expenditures, as would naturally be expected. Why economize when next year's income will probably be as large? The municipal splendors that result, such as the Hibbing High School and the new Community Building in the "Iron-ore Capital of the World," can scarcely be appreciated as they would be did the bulk of the cost come out of the citizens' pockets instead of the pockets of some one else—the operators.

Further indication of a tendency to "soak" the operator is the recent decision of an industrial commission referee in Hibbing which awarded a miner $1,700 compensation for alleged facial disfigurement from sparks struck from an anvil in the course of his daily work. Eczema, said the company physician, but the miner won, and thereby an opening was made into a new field whereby village blacksmiths may add to their income.

The Utility of Pilot Knob

WHILE forests are being recognized as meriting the principle of protection, and vast federal forest reserves have been created, the principle of conservation of mineral wealth is yet nebulous, and no national policy, even in any one detail, has yet been formulated. The need of it is generally felt by students of the subject; for minerals, is cannot be too often repeated, represent the one group of essential commodities which cannot be propagated.

Allied to the same problem is that of preserving from destruction typical and important geological examples, and of designating them, in parks and places of frequent resort, by simple tablets and descriptions, so as to

familiarize the public with some simple facts of geological history. If the houses and other interesting spots of history since the first landing of Europeans in America are worthy of preservation by societies and special funds, and if the records of greater antiquity in Mexico and Egypt are worthy of zealous investigation and jealous safeguarding, surely the historic records which reach back millions of years should be safeguarded where they are especially valuable, and should be appropriately marked for the benefit of all generations.

A special example is Pilot Knob, in Missouri, a historic and geologic landmark. The top of Pilot Knob is a stratified Pre-Cambrian beach black-sand deposit, this patch representing the only Pre-Cambrian sediments in a vast surrounding area, and, which is still more important, a remarkable and possibly unique preservation of an ancient black-sand deposit. Ripple marks, raindrop marks, and sun cracks mark the surfaces of many of the exposed layers of granular hematite, a testimony to the similarity in many respects of Pre-Cambrian weather and strand conditions to those of our own day —a most important contribution to geology also, in consideration of many theories which have been published concerning the origin of the Pre-Cambrian Lake Superior iron ores.

Of all the original vast extent of these beach sands and contemporary sediments of this period, the top of Pilot Knob is the sole survivor, a mere accidental patch left by the long Pre-Cambrian erosion, testifying to a vast period in the history of the region, which otherwise would never be open to the interpretation of mankind.

Like modern beach sands, this ancient deposit is an indifferent iron ore, not mined under present conditions, still, from the industrial standpoint alone, a valuable future asset to the State of Missouri and surrounding regions. This ore is now being quarried and used for the surfacing of highways, for which it is well fitted: and the top of the mountain is so small that these operations may easily remove the whole extreme summit, with the geologic monuments described, and also the value, in case of emergency, of the material as iron ore. There are other materials in abundance near by which would be satisfactory as road metal, and this would appear to be a clear case where a historic geologic record as well as a metal reserve could be managed from the public standpoint to better effect.

Prospecting With the Magnetometer

JUST as there is no royal road to riches, so there is no easy way of discovering mineral wealth. For all this, the impression exists in many unsophisticated minds that somewhere there is a magic means that will unlock the treasures of the earth. To such the work of modern science so often looks like magic that their belief in magic is seemingly confirmed, though not admitted. For this reason, no doubt, the divining rod, against which so much has been written with apparently so little effect, continues well accepted by many people, and legitimate geophysical prospecting devices have promptly been credited by many with more value than they have yet been demonstrated to possess.

This has been manifested in an interesting way since the appearance, in the issue of *Engineering and Mining Journal-Press* of Feb. 20, of an article by K. C. Laylander, describing a case where magnetometric surveying was employed as an aid in exploring placer ground. Since then the author has received more than 150 inquiries as to where his magnetometer was purchased, and similar requests for information have been addressed to the *Engineering and Mining Journal-Press.* Many of these inquiries indicated a simple lack of common sense and failure to understand that an ore deposit cannot be located by magnetometric work alone. Like other instruments used in geophysical prospecting, the magnetometer is simply a useful adjunct to the geologist and his work. Many, however, seem to think that it is the doodlebug, baptized and admitted to the brotherhood, and that in some mystic manner it will tell the possessor where to dig. Such people will do well to note what Mr. Laylander said in his letter in last week's issue—namely, that when carried out by *competent persons,* the magnetometric survey will map any given area with respect to relative magnetic intensities, and that with such a map in hand one may intelligently select the best ground, in any area covered, *in which further to prospect and develop a mine.* This is Mr. Laylander's opinion, and it is likely that it is all that a magnetometric survey will ever do. It is simply a preliminary step in developing a mine.

Red Lake Flotations

ASIDE from the discovery of some gold ore on the Howey property, practically nothing has been found to date on other claims in the new Red Lake district, in Ontario. Three established Canadian mining companies have prospectors and engineers in the field, have staked a goodly acreage, and are now beginning drilling operations. Many snow-covered claims have been staked by others on the chance that gold-bearing outcrops will be revealed when finally the snow disappears.

The district is remote from the railroad, about 130 miles, in an almost unexplored and unmapped region. This, however, does not deter the hardy prospector of this northland from at least trying to "make his stake." It would be gratifying if all who venture into this new field could realize their hearts' desire. Those who remember the Klondike stampede, the gold rush of Nome, the mad scramble into the Black Hills, the hardships endured on Chilkoot pass, and who recall the days of '49, know only too well the tragic disappointment that must come to the majority.

The Red Lake rush utilizes the airplane, which adds another thrill to the ever-exciting quest for gold. This assures a quick but expensive means of transportation, and makes it possible to transport emergency rations and medical aid. Thus one of the hardships of these rushes is removed.

There is a more important side to the Red Lake activity than that presented by winter-staking expeditions. As pointed out by the Toronto *Globe,* there are some glaring instances of absurd capitalization in connection with the Red Lake flotations. Organizations are proposing to sell units on a basis to bring in $1,000,000 or $1,500,000. The price actually paid for the claims which constitute the assets of these syndicates was nominal and but little if any development work has been done as a basis for valuation. The public is being asked to take a chance on syndicate grubstaking and other risks equally uncertain. Red Lake seems to be a magic phrase calculated to draw gold from the

pockets of speculators, if not from the claims that are being staked promiscuously over a widespread area that is covered with a thick mantle of snow.

The absurdity of placing a market value of well over $1,000,000 on a few claims concerning which no information exists that would lead anyone to believe that economic deposits of minerals are present hardly needs to be emphasized. Red Lake syndicates are springing up like mushrooms. All this has occurred on the strength of the Howey find. Other claims have been staked that are miles away. The ground that is close-in to the Howey and along the same mineralized zone may have interesting possibilities. Outlying ground that has been winter-staked is almost as highly speculative as if it were 100 miles distant.

It is too much to expect that there are innumerable gold mines in the making in the Red Lake camp. Judged by past experience, the development of three or four mines of respectable size within a period of several years would be as much as might be looked for. Red Lake may be greater than Porcupine, Kirkland, and some others, but this has yet to be proved. Prospective investors would do well to scrutinize the various new flotations carefully before parting with their money.

Refractory Gold Ores Yielding to the Metallurgist

A RECENT ARTICLE in *The Mining and Industrial Magazine* of South Africa describes some of the latest metallurgical practices in Rhodesia, where some of the ores are exceedingly refractory and not amenable to ordinary methods of amalgamation and cyanidation. There, as in Australia, flotation has proved to be a valuable aid in the treatment of gold ores that have given only disappointing results by other processes. Among the companies that have recently adopted a new and more successful flow sheet is the Cam & Motor. The ore here is a greenstone in which the gold is associated with pyrite, arsenopyrite, and stibnite. A combination of mechanical concentration of the coarser portions on vanners, regrinding of the tailing in tube mills, flotation treatment of the slime, and amalgamation is practiced. Arsenic is removed by roasting, a process which also aids in the preparation of the ore pulp for cyanidation to recover the gold. Briquetting and smelting, presumably of the leached residue from cyanide treatment, produces a rich antimony metal and matte. Electrolytic precipitation of the antimony has recently been carried out, this process making an additional recovery of gold possible. About 20,000 tons of ore per month is now being treated by this company, with a gold recovery of 85 per cent, and at a profit of over £21,000 per month.

The ore at the Sherwood Starr mine contains a mixture of auriferous pyrrhotite and marcasite. About 90 per cent of the gold is removed by flotation, but the concentrate is not amenable to cyanidation, either with or without roasting, so is shipped to a smelter.

At the Sabiwa property the gold occurs in pyrrhotite, marcasite, and arsenopyrite. It is crushed in cyanide solution and slimed, concentrates being removed by blankets and reground with strong cyanide solution in pans of the "Forward Down" type. The pulp is agitated in pachucas and eventually filter-pressed.

Gold metallurgists all over the world will be anxious to hear more of the details of the processes employed at these three plants and of the work being done in the Kalgoorlie district, in Australia, where flotation of gold ores looks promising. With the advances made in ordinary, differential, and selective flotation practice in the last two or three years, this method of treatment would seem destined to become a much more important step in the treatment of complex gold ores than it has so far been. Not only can minerals be removed which interfere with cyanidation, but valuable byproducts can be recovered, such as antimony, and, if it may also be called valuable, arsenic.

The Gold Miner's Profit

NO ONE KNOWS BETTER than the gold-mine operator that all is not gold that glitters, and he is equally well aware that all is not profit that is gold. How little he gains from his production at times may be illustrated by many an actual case. With the price of gold standard at $20.67 an ounce (though he receives $20 an ounce or less), he has suffered from increased wages and costs of supplies ever since the war upset economic conditions. An old story this is by this time, but perhaps even now some do not realize how straitened the gold miner's circumstances, in general, are. In the report of the North Star Mines Co., of California, for 1925, which has recently made its appearance, this old Mother Lode operator announces a production of $774,941 and a net deficit of $142,574. Outlays for current operation were $671,117 and for development $399,184, of which $137,170 was charged to current expenses and the balance carried as a temporary asset. The amount charged to operation and development therefore exceeded the value of output by $33,346. After allowing $22,176 for depreciation and $143,785 for loss on a mining option, and crediting certain miscellaneous income of $55,767, the net deficit was as stated. The figures tell the story.

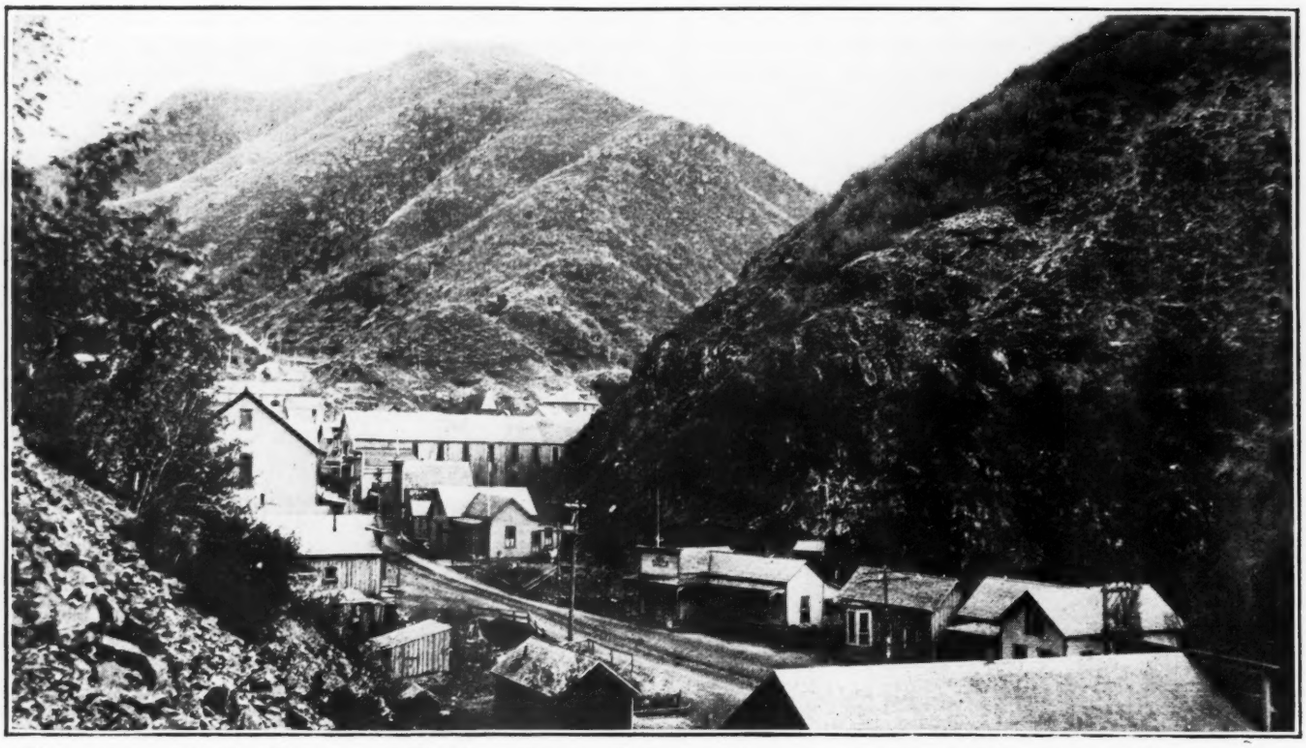
W. D. Pagan, secretary of the North Star company, in a short letter in this issue, tells the story better. He tersely states the facts: In the last eight years the company has produced $6,812,000—an important amount of gold. Out of every dollar produced, he says, 98c. went for costs. In the last three years, including development charges, the cost of $1 in gold was more than $1. Had the rate of earnings in 1913 continued during the last eight years, $3,500,000 in profits would have been made instead of $115,000—an insignificant return for eight years' operation of a property of this size.

A Good Home for Mineral Specimens

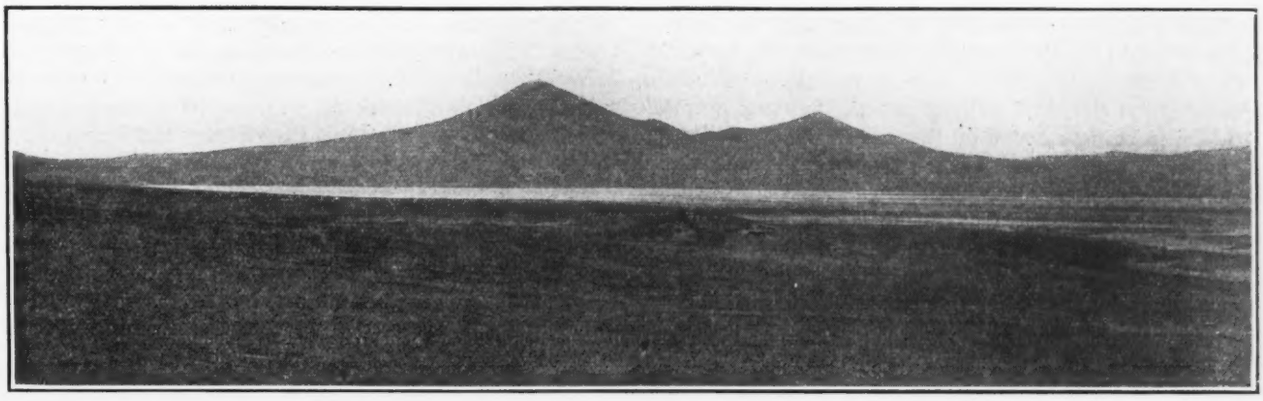
IN HIS INTRODUCTION to a recent bulletin on the minerals of Idaho, Earl V. Shannon explains that the U. S. National Museum at Washington is in a position at all times to carefully identify any mineral which may be sent in for examination, free of charge, and any specimen of merit which may be donated is assured of careful and permanent preservation in the Museum collections. In fact, his monograph on Idaho minerals was largely based on specimens forming a part of the Museum collection. This offer might well be remembered by mining men who wish to have unusual occurrences identified, and who are looking for a proper place for the exhibition of choice specimens.

Utah Copper Company's Mountain of Ore

Twenty-five Years Ago and Today



The mountain, in the distance, up Bingham Canyon, before mining was started. Below, from a different viewpoint, is seen the same mountain at the present stage of operations. To date, 131,894,551 tons of ore and 71,191,366 cu.yd. of stripping have been removed. The total tonnage of ore mined and to be mined from inception of operations to exhaustion of present estimated reserves approximates 646,000,000, according to the company's report for 1925, recently issued.



Looking across typical salar. Note absence of vegetation

The Andean Salares

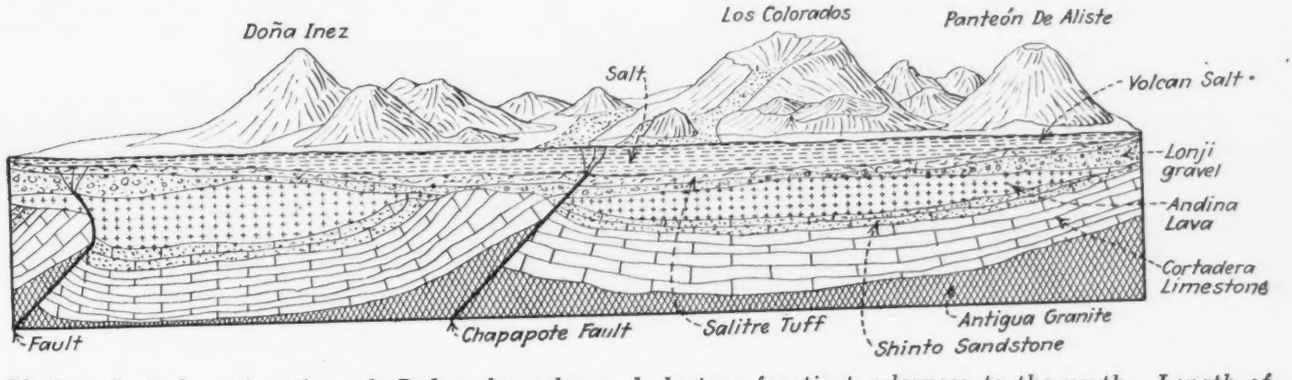
Volcanic Mud Flows Source of Saline Beds Composed of Halite, Gypsum, and Anhydrite—Deposits Cover Vast Areas in Chile and Argentina

By James E. Harding
84 Wall St., New Haven, Conn.

THE MAIN RANGE of the Andes is made up of lofty and rugged mountain peaks, for the most part extinct volcanos, deployed in a series of offset parallels as well as parallel overlapping ranges, forming altogether one stupendous mountain chain. Between the individual ranges in all cases, and sometimes between the individual peaks of the same range, lie long and narrow synclinical gravel plains. In some cases such plains, as a result of a quaquaversal fold, form great shallow basins; in others, by interior folding, minor anticlines or small overthrust faults are produced, while in the majority of cases the entire plain is simply a wide, rather flat, syncline. These synclines vary from 5 to 15 miles in width and from 10 to 100 miles in length. The east and west boundaries of such plains are generally great north-south continental faults, along which here and there clusters and rows of volcanoes broke out. In practically every group of volcanoes, one or several developed through many eruptive epochs to a stage ejecting great volumes of mud, carrying gypsum, anhydrite, halite and other salts, all probably in solution. These great masses of mud rose to the top of the craters, overflowed the rim, swept down the steep mountain sides, burying smaller mountains, and at length came to rest far out on the flat plains around the foot of the mountain. Thus were laid down these mud flows, the original source of the material making up the great *salares* of today.

Though in the main points all of these *salares* bear a close resemblance, they differ in details. In some cases running streams come down from the mountain-peak glaciers and make small lakes of fairly fresh water, inclosed in a field of solid salt. In other cases subterranean streams break out of either gravel or rock, and along the margins of the streams are narrow patches of grass. In the Salar de los Infieles, a spring of water highly charged with hydrogen sulphide breaks out of the rock at the margin of the salt and colors everything around it jet black.

Great variation in the size of these *salares* is to be noted. Infieles, mentioned above, does not cover more than a few square miles, whereas Antofaya, in the Argentine, covers over 5,000 square miles. There are more than 100 of these *salares* lying on both sides of



Ideal geological section through Pedernales salar and cluster of extinct volcanoes to the north. Length of section about twenty miles; depth 6,000 ft.

the continental divide over a width of, say, 200 miles and over a length of about 600 miles. In the aggregate it is probably safe to state that there are in sight at least a thousand billion tons of the three minerals gypsum, anhydrite, and halite. At one location a small operation is being carried on for the recovery of borax, but none of the *salares* are being operated for their commoner contents. Distance from markets, low value per ton of material, transportation costs, and the difficulties incident to working in a high-altitude desert will not permit the product of this region to compete in world markets with that from more favored localities.

Dreariness and Desolation Supreme

It would be hard to imagine a more desolate and dreary landscape than one of these *salares*, stretching away as far as the eye can reach, pale white and dead gray in color, unbroken by even the smallest elevations, swept by icy gales even in summer, daily lighted by a cold sunlight so bright that it hurts, and the whole enveloped in a mirage by day like a dancing white flame which weirdly distorts objects even fifty yards away.

In spite of conditions so repulsive to the human race, many birds and animals abound. One small bug, about five-eighths of an inch long, with legs and body like a helgomite, is apparently able to live entirely on the salt. At any rate these insects are to be found many miles from the shore, and in pursuit of them there are sometimes a few birds of the wren type. In the small pools around the margins, where infiltration of fresher water makes small pools with a bit of grass here and there, aquatic bird life is fairly abundant. Stately light-red and black flamingoes, a black-and-white variety of wild goose, one large variety of wild duck like a pintail, three varieties of teal duck, three varieties of snipe and two of grouse, as well as vicunas and foxes, have been observed.

Volcanic Disturbance Began in Lower Cretaceous Time

Geologically, the history of the region is as follows: Until about the middle of the Lower Cretaceous this area lay submerged along the Atlantic shore of the South American island, at which time it began emergence. That cycle of movement terminated with and was temporarily stayed by a great volcanic disturbance, furnishing large intrusions of rhyolite and great outpourings of andesite, which built up many great volcanic peaks. Then there followed a long erosion cycle, which cut deep valleys in all formations, after which another cycle of uplift started and terminated in volcanic eruption and mountain building. To this last period belong all the high peaks shown in the background of the accompanying section drawing. Then followed a period of very cold climate (glacial) erosion, which planed down many hills, depositing wide and smooth gravel plains, burying older plains and valleys completely as well as lower hills. During all this cycle the volcanoes in this region had been dormant. Suddenly they again broke loose in a series of violent explosive eruptions, in which a tremendous amount of tuff was produced and hurled high in the air, settling on the plains at great distances from its source.

Of the peaks shown in the background of the accompanying section drawing, Doña Inez has not yet developed its tuff explosion; Panteón de Aliste blew up on a small scale only, but Los Colorados made up for the lack of activity on the part of the others by hurling out tuff through an orifice about three miles in diameter. Along the main Cordillera hundreds of other peaks covering a distance of a thousand miles or more were performing similar antics at more or less the same time, which should entitle this range to nearly front rank in the world's known seismic cataclysms.

The tuff derived from such explosions covered what was then the continent from coast to coast, and longitudinally for two thousand miles to great depth. Remnants are still to be seen over 200 ft. deep, and it is reasonable to predicate that a depth of at least a 1,000 ft. existed in the region of greatest thickness, before erosion affected the soft and yielding surface. It is worthy of note that there can be no question that Chile's present deposits of nitrates owe their origin also to this same tuff.

At length, the great pressure which had caused the tuff explosions began slowly to subside, and it diminished to such an extent that the tuff, instead of shooting high into the air, flowed from the open crater in great streams of water-saturated mud, down the precipitous lava slopes, and came to rest far out on the more level plains below. Such eruption terminated when a great plug of snow-white, aphanitic rhyolite arose in the throat of the crater and in cooling sealed the great orifices from which had come such tremendous volumes of lava, pumice, liquids, and gas.

Cycle of Precipitation Followed by Arid Climate

Following the tuff ejection came a cycle of heavy precipitation which washed out deep gulches and valleys through the tuff and lately deposited gravel and cleared out for the second time some of the ancient water-courses, which had long been buried. This wet cycle continued until it had removed a large portion of the newly fallen tuff and then gave place to a cycle of arid climate which at present affects the region of the Atacama desert, Chile.

The mud flow seems to have carried within it a large amount of gypsum, salt, some borax, and nitrates, as well as other more easily soluble salts. Now no trace of nitrate can be found in the mud, which is quite reasonable when one considers the relatively great solubility of nitrate salts. Possibly the sodium, chlorine, and sulphur parts of the various salts now existing came from sources incident to the volcanic activity, but it is more probable that the calcium of the gypsum and anhydrite came from the limestone beds through which the volcanic acids and gases passed on their way to the surface.

Extensive Wind Erosion

From the surface of the mud flow, erosion, largely by wind and less by water, has removed a large amount of salt, leaving exposed great mounds of pure gypsum crystallized in transparent masses from which plates a foot wide and two feet long may be removed in abundance. These mounds in some cases were composed partly of salt, as many collapsed areas testify, where solution and wind erosion have removed the salt sufficiently to cause mounds to disintegrate. Between the closely spaced mounds of gypsum is either pure salt or salt-cemented mud. In the case of the Salar Pedernales these mounds are countless in number, thickly studded over an area of more than 45 square miles.

In the altitude in which the *salares* are encountered practically all precipitation is in the form of snow,

which slowly melts and passes downward into the mud, taking up salt rapidly, until a complete state of saturation is reached. Owing to the great permeability of the material which forms the plain on which the *salar* lies, the water level varies but slightly from an absolute plane, which has a seasonal rise and fall, caused by both direct precipitation and inflow from higher elevations.

Apparently, in the original mud flow, the gypsum was in a state of solution, and, assisted both by gravity and molecular attraction, migrated nearly vertically, and thus by a process not unlike magmatic segregation formed a greatly enriched stratum on the bottom of the mud flow. Being nearly insoluble in water, it migrated only a short distance and then became fixed both as to position and condition.

On the other hand, the salt, owing to its easier solubility under all conditions, has been redissolved many times and has migrated vertically as much as the gypsum and horizontally a tremendously greater distance, forming along the outer border of the mud flow, by migration and desiccation, a great horseshoe-shaped field of nearly pure salt, covering about 60 square miles to a known depth of over 100 ft. in places. If the average depth is taken as only 50 ft., there are more than ten billion tons of salt and gypsum in the one field of Pedernales, a rather small *salar*.

Underground Structure at Pedernales

Of this *salar*, of course, the surface gives very little clue to the underlying geology, but, owing to the fact that a deep canyon dissects the plain a short distance away, I am fairly certain of the geology beneath.

At about the middle of the section will be seen the heavily lined Chapapote fault. On the line of this fault, out in the midst of the salt field, is a small seepage of petroleum, an occurrence which one would hardly expect. However, it is really not so surprising in view of the known underlying geology. The possibilities for striking oil here were obviously not promising, but a certain company made the attempt with an ordinary rotary placer prospecting drill, and succeeded in getting a hole down to a depth of nearly 330 ft., where it was lost. No oil was struck. While this hole was being drilled, many very interesting salt crystals came up in the core, which crystals had been formed about a nucleus of a small oil drop.

The Chapapote Fault

This Chapapote fault extends through the country for many miles and crosses the Pedernales *salar* completely. It apparently serves as a conduit to bring water to the *salar* from a long distance, because along its course in the *salar* are found, with walls of pure salt, many large open caverns full of water, with small horizontal cross-sections and nearly vertical walls extending down to great depth. One of these caverns was sounded to a depth of over a hundred feet. The caverns present a most beautiful appearance, with water of deep transparent blue, held in a huge vase with walls of great pink, green, and blue salt crystals. This fault, which produces so many of these vertical caverns, together with many other faults not shown on the section, probably is connected with some other great system, and serves as an underground drainage for this basin, which covers more than 1,500 square miles and contains no visible outlet but evaporation.

Salt plain surrounding gypsum mounds. Note dissected foreground

Rough eroded and dissected surface of salt field

Close view, gypsum mound. White areas, anhydrite; dark, gypsum

Effect of Daily Temperature Changes

The coefficient of expansion of salt is about one centimeter per kilometer per Centigrade degree change of temperature. The maximum temperature change is about 25 deg. C. Thus daily there is produced a great expansion of the crustal area, manifesting itself by continuous crackling. When the air cools down at night there is a corresponding shrinkage and the surface breaks up into blocks of all shapes and sizes. The wind blows salt dust and sand into the cracks, forming small veins. By means of such expansion and contraction the

entire surface crust is in continual motion and one may see in the making, within a few days' time, a complete system of overthrust faulting develop from folding to final rupture and overthrust, on a miniature scale. This action produces an amazingly rough surface, over which it is very difficult to travel either on foot or on horse or mule.

Several years ago some engineers noticed the previously mentioned water-filled caverns, and, attracted by the great porosity of the surface as well as the fact that water could always be found within a foot or two of the surface, suggested that there might be enough water in the voids of the salt to furnish power for a hydro-electric plant. So a tunnel was driven from the wall of a near-by deep canyon and the water tapped. The flow of water from the tunnel was measured by means of a weir and the recession of the water level in the *salar* noted for a period of more than two years. This water had a specific gravity of nearly 1.2 and was a completely saturated solution, carrying over 336 grams of sodium chloride per liter.

Much to the surprise of the engineers, who had figured that it would be necessary to use bronze tools to avoid rusting, it was found that this solution had no power to oxidize even the polished steel shovel blades left in the water over a period of months. When salt was produced in air, by desiccation, it formed in delicate arboraceous patterns, and when precipitated under water developed solid isometric crystals. Given a nucleus, even in a swiftly flowing stream, quarter-inch cubes would form in a few months.

Experiments were also carried out to determine the height at which capillarity ceased. This was done by means of small tank, filled with the regular surface material of the *salar*, in which the level of the water could be held at any desired height by means of a feeding device. Instead of capillarity being effective at five or six feet, as with fresh water at low altitude, capillarity here was only effective to cause evaporation, when the surface of the water was within about one foot or less of the surface, and ceased altogether when the water level was one foot nine and one-half inches below the surface.

Drawing off of the water revealed that the pits and holes so noticeable on the surface extended down to a depth of only about two and one-half feet, below which point there were practically no voids, and therefore little water was available for hydro-electric energy.

While working on these *salar* problems I have often wondered if the famous salt domes of Louisiana and Texas might not originally have been formed in somewhat the same way as those of the Andes and brought to their present shape by some sort of folding and internal growth.

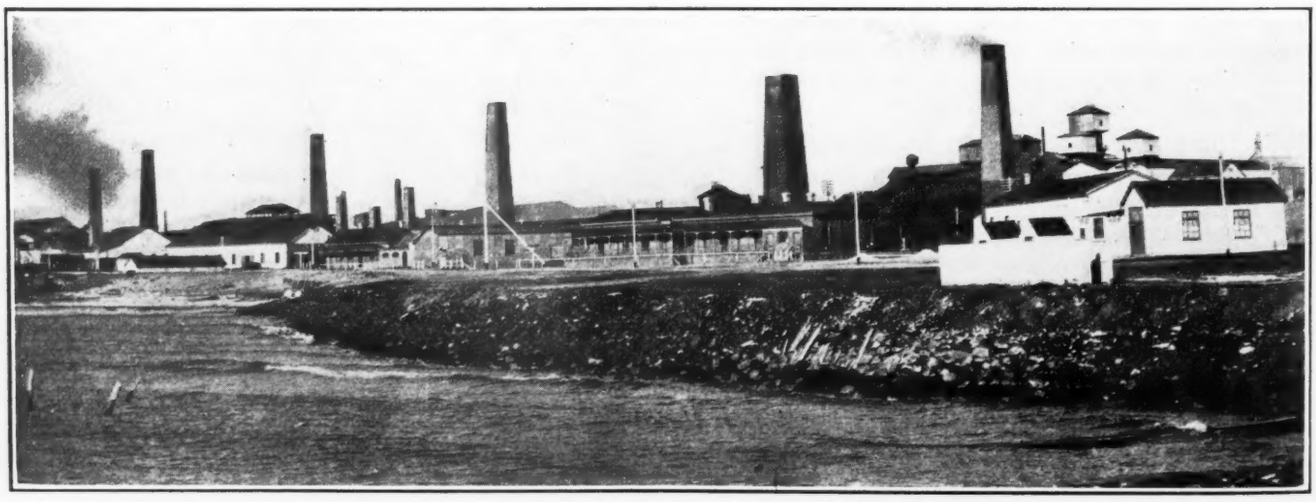
Electric Welding Facilitated by Copper-Tungsten

A copper-tungsten electrode, the development of which is expected to prove of great value in the fabrication of metals, is now available for use in manufacturing. One of the limiting features in many resistance or spot-welding operations, it is said, has always been the copper electrode used, the pure copper not being hard enough when used under the high pressures at high currents common to this type of welding. Usually, after a few welds are made, the surface of the copper electrode in contact with the weld becomes hot enough to anneal the copper, thus making it very soft. As a result, the copper tip rolls and mushrooms over the edges, giving a large spot weld which changes the current density and the quality of the weld.

Copper-tungsten, as its name indicates, is a mixture of two metals, one a good electrical conductor and the other very hard. The alloy has a hardness of 225 (Brinell), compared with 82 for hard copper and 30 for soft copper. The compressive strength of the copper-tungsten is 208,000 lb. per square inch, against 58,000 lb. per square inch for hard copper. The tensile strength is 56,350 lb. per square inch, compared with 30,000 lb. for soft copper and 50,000 to 70,000 lb. for hard-drawn copper.

Copper-tungsten does not anneal at red heat. Thus there is no soft surface metal to roll or mushroom over when used in resistance welding. It has not been found necessary to form the entire electrode point or die of copper-tungsten, but rather to use inserts of this alloy by any one of a number of methods, such as forcing an oversize piece in a hole in the die, brazing a block in the wearing surface or placing pieces in a mold and casting the die around them.

In view of the higher first cost of copper-tungsten, its chief value is expected to be in special applications. It is particularly adapted for use under severe conditions where copper will not stand up. It has been given the name Elkonite, and it was developed by the General Electric Co.



Copper smelter of Wallaroo & Moonta Mining & Smelting Co., at Wallaroo, South Australia

A Possible New Lead Ore Area in Missouri

Mineral Disseminated in Cambrian Limestone—Little Prospecting Done—Barite Shipments Have Been Made

By Karl L. Kithil
Consulting Engineer, Denver, Colo.

Karl L. Kithil

THE occurrence of galena in the vicinity of Damsel, Camden County, Mo., has been reported from time to time. There is no doubt that galena exists on a number of the farms, but it can only be referred to as surface showings. A few shallow shafts have been opened up in which ore was found in more or less irregular masses, imbedded in the limestone or in a chertlike formation. At places along the hillside, however, exposures show a conformable series of limestone strata. These are horizontally bedded, or nearly so, and it was between these layers of limestone that galena was found imbedded in silicified and chertlike material. The ore occurs in small pockets and seams without any regularity. It is a high-grade galena, and can be easily separated from the adhering gangue matter. These beds, so far as could be observed from the outcrops, are from two to four feet thick. The mineral is also disseminated throughout the beds at the exposures. At some places several such outcrops were observed in successive layers. This would indicate that there is a possibility of finding ore over a considerable area and perhaps also at depth. Nothing could be learned from the geological features in the district with regard to the extent or the depth that mineralization has taken place. Some of the mineral is deposited in perfect cubic crystals of varying sizes, especially where it is imbedded in highly siliceous matter. There are no signs of folding or faulting within the area under consideration.

All Lands in Region Are Owned by Farmers

All the lands covering the region under investigation are owned by farmers, in fee, so that lands on which lead is found or suspected can be leased, or bought at $12 to $15 per acre, from the owners. They require in all cases a small payment in cash for the signing of leases. The leases are for a period of three years, with payments of a small bonus for each acre of land under lease from the second year on, if no work has been done during the previous year by the lessee. The lease which they prefer is the customary "Gas, Oil and Mineral Lease" which is issued in printed form. Royalties from 10 to 12½ per cent are demanded for all ore produced or sold.

The field includes a territory covering from 3,000 to 5,000 acres of land, but further investigation and development may extend this area. From present indications it would appear that the most promising area lies within sections 21, 22, 23, 26, 27, 28, 33, 34 and 35, of Township 39, Range 16. There are, however, favorable indications of ore deposition in sections 8, 9, 16, and 18 of the same township and range. Mineral has been reported at points near the town of Linncreek. An extension of the mineralized area in that direction would be of great importance.

District Long Neglected by Natives

The district has been neglected, or overlooked, on account of its isolated position and the lack of initiative on the part of the natives to prospect or develop their resources. A new road leads to a ferry over the Osage River at Bagnell, to Linncreek, traversing the district in which the lead ore is found. Bagnell is the terminal station of a railroad running from Jefferson City, Mo., to Bagnell, Mo. Linncreek is the county seat of Camden County and is also located on the Osage River. The distance from Bagnell to the heart of this lead district is perhaps 16 miles. The road is in good condition and it affords fair transportation throughout the year.

Samples which were taken contained about 30 per cent lead. The silver content was only 0.8 oz. per ton. As these samples had much of the gangue material chipped off, they cannot be considered criteria of what average grade of ore could be obtained by mining. It seems feasible, however, to assume that an average ore of 5 per cent lead can be mined and that such ore can be milled at a reasonable cost by modern scientific methods.

It is my opinion that this area is worthy of more careful investigation, study and development, which might lead to the opening up of a new field and satisfactory exploitation.

Barite Occurrences May Be Important

Attention should also be given to the occurrence of barite. The mining of this mineral has been done in a very primitive fashion by the natives, and the few carloads shipped out were of high grade. The presence of the barite should be studied, as it may have also a decided bearing on the field itself.

That part of Missouri under consideration is on the northern flank of the Springfield uplift, which belongs to the Cambro-Ordovician formations. The ore is disseminated in Cambrian limestone. The area where the ore is found forms a plateau which fills the area of a large bend in the Osage River, between Bagnell and Linncreek. Topographically, the country is a simple rolling plateau, much broken by erosion, dotted with small hills. The undulating surface shows residual outliers of the limestone beds.

Hydro-Electric Power from Osage River

Something should be said of the large hydro-electric power project which is planned for the Osage River a short distance above Bagnell. Though this project will take several years to complete, consideration must be given it by anyone entering this field. The backwaters will surround part of the district and will rise to levels which may cover up some of the lower ground of the mineralized area. It may have also a decided effect on any operations carried on for the purpose of recovering lead from depth.

Legal Difficulties in Way of Resumption of Hydraulic Mining in California

An Authoritative Analysis Has Been Made of the Status of the California Débris Commission and the Position of the Hydraulic Miner by a Committee of the State Development Association

A COMMITTEE appointed by the Northern Mineral Executive Committee of the California Development Association to report on the feasibility of resuming hydraulic mining in California under present conditions has presented the following report, which is of considerable interest in that it dissects the legal phases of the question. The report is by John F. Davis, chairman of the committee; Lloyd L. Root, state mineralogist, and Robert I. Kerr, secretary of the California Metal and Mineral Producers' Association.

One of the most interesting phases of mining law in California, states the report, is the federal statute creating the California Débris Commission. The government had sold to the agriculturalists in the valley their land and to the miners in the mountains their placer claims, had given to each patents with equal covenants "to have and to hold," and had collected from each side the fees for the respective lands in the Land Office with equal urbanity. It had been decided in the Federal Court in the case of Woodruff *vs.* The North Bloomfield that the débris from the mine, the result of mining by the well-known hydraulic process, was injuring the lands adjacent to the navigable streams below. The magnitude of the extent of hydraulic mining had been its undoing. Choking up of the overtaxed channels of the rivers, the covering of valuable adjacent lands, and the injury to navigation had brought all parties down upon the offending industry. Private individuals invoked the doctrine "thou shalt so use thine own as not to injure thy neighbor's," the state protested against interference with its water and land interests, and the Federal Government, despite its covenant in the deed to the miner, objected to the obstruction to navigation. The bitter feeling engendered among the interests injured and the industry was so great that for years no effort was made toward any rehabilitation of hydraulic mining.

It is true that in the decision of the Woodruff *vs.* The North Bloomfield case, brought by an individual, and in the People *vs.* Gold Run case, brought by the State, the hydraulic process in and of itself had not been declared unlawful, but hydraulic mining as theretofore conducted where it contributed or threatened to contribute in a material degree to the filling up of river channels, injuring navigation, or covering the lands adjacent to the navigable streams, with débris, was declared a public nuisance and prohibited. Judge Lorenzo Sawyer, who decided this Woodruff-North Bloomfield case, realized the awful damage that would ensue to entire sections of the state by the closing down of these mines, and left a fair opening, making certain suggestions of possible conditions under which the injunction might be dissolved. The North Bloomfield company constructed the suggested impounding works, and the United States then brought its own action in the United States Circuit Court for an injunction against the North Bloomfield company. The injunction was denied, the court holding that, by reason of the impounding works constructed, the light matter floating over the dam was harmless; that any danger to be apprehended from the operation of the North Bloomfield mine, with its impounding reservoirs as constructed and used and intended to be used, was too remote to justify the court in issuing an injunction.

California Débris Commission Act Approved

Then came the Federal California Débris Commission Act, approved March 1, 1893. As the act was the work of Congressman Caminetti of the then Second Congressional District, it became colloquially known as the "Caminetti Act." It was a river and navigation act. The government did not desire avowedly to attempt to pass any legislation in aid of any special industry, and it could not afford to admit any moral responsibility arising out of its deed to the miner, but it could, on the theory of aiding navigation, carry out a certain patrol of navigable streams.

The act provides for the creation of a commission of three members, to be known as the California Débris Commission and to be selected by the President, by and with the advice and consent of the Senate, from officers of the Corps of United States Army Engineers, which commission has its authority and exercises its powers under the supervision of the Chief of Engineers and direction of the Secretary of War. The jurisdiction of the commission with reference to hydraulic mining extends to all such mining in the territory drained by the Sacramento and San Joaquin rivers. Hydraulic mining, as defined in Section 8 of the act, directly or indirectly injuring the navigability of these two rivers, carried on in said territory other than as permitted under the provisions of the act, is prohibited and declared unlawful.

The act made it the duty of the commission to mature and adopt such plans as would improve the navigability of all the rivers comprising the system, deepen their channels, and protect their banks, with a view of making the same effective as against the encroachment of, and damage from, débris resulting from mining operations, natural erosion, or other causes, and permitting mining by the hydraulic process to be carried on, provided the same might be accomplished without injury to the navigability of the rivers or to the lands adjacent thereto. The commission was also empowered to examine, survey, and determine the utility and practicability of storage sites for the storage of débris, with a view to the ultimate construction of impounding dams and reservoirs, and permitting hydraulic mining to be carried on behind them. It prescribed a complete system for application of those desiring to submit themselves to the jurisdiction of the commission, of the necessary notices, publication, examinations, hearings, and so on. The works were to be constructed under the direct supervision of the commission, but at the expense of the parties, and the permit to start mining was not to be issued until

after inspection and approval of the completed work. This permit might, for cause, be revoked, or its terms modified from time to time, by the commission.

Hydraulic Mining Controlled by Commission

It will be noticed, the report states, how absolutely hydraulic mining in the Sacramento and San Joaquin River basins is placed under the thumb of the commission by the language of the act. Not only that, but the act actually compels the miner practically to deed back to the government the right to mine at all by the hydraulic process except under the provisions of the act, at the time he presents his application to the commission. It contains the remarkable provision that the petition to the commission to be permitted to mine "shall be accompanied by an instrument duly executed and acknowledged, as required by the law of the said state, whereby the owner or owners of such mine or mines surrender to the United States the right and privilege to regulate by law, as provided in this act, or any law that may hereafter be enacted, or by such rules and regulations as may be prescribed by virtue thereof, the manner and method in which the débris resulting from the working of said mine or mines shall be restrained, and what amounts shall be produced therefrom."

This is the act that the carefully advised members of the anti-débris association in Marysville and Yuba City construed as a governmental commission to regulate and protect the navigability of the rivers and which the miners of Nevada City hailed as a rehabilitation of hydraulic mining. The showdown came later.

Soon after its adoption a number of permits were granted and a number of mines actually started. The superior courts of the lower counties were thereupon petitioned, however, for injunctions. The Red Dog hydraulic mine was quickly closed down by an injunction from the Superior Court of Sutter County; the Polar Star mine was closed down under a temporary restraining order from the same court, and other suits were threatened and begun against other mines that had begun to operate under the jurisdiction of the commission; but, for different reasons, not a single case in which a mine was closed down was appealed to the Supreme Court of California, to test the efficacy of a permit under the new act.

California Legislature Passes Controlling Law

While the bill had been pending in Congress there was passed by the Legislature of California an act introduced by State Senator Torey L. Ford, of the Nevada district, which, as sections 1424 and 1425 of the Civil Code, was approved March 24, 1923, the terms of which are as follows:

> "1424. The business of hydraulic mining may be carried on within the State of California wherever and whenever the same can be carried on without material injury to the navigable streams, or the lands adjacent thereto.
>
> "1425. Hydraulic mining, within the meaning of this title, is mining by means of the application of water, under pressure, through a nozzle, against a natural bank."

This was a codification of the principle involved in the decision of the United States *vs.* North Bloomfield case and of the accepted definition of hydraulic mining. Section 1424, however, is manifestly in direct conflict with the provisions of the Débris Commission Act, and with the interpretation, both federal and state, soon to be given to that act, and that section is nugatory in the Sacramento and San Joaquin watersheds, though still in force as to the remainder of the state.

The North Bloomfield company, as had been shown, had constructed its restraining works before the creation of the commission, and those restraining works had been decided in a case by the United States against the company to be sufficient, and the application of the government for an injunction denied. The company, therefore, did not submit itself to the jurisdiction of the commission. Several years after the act was passed, the government again brought an action against the North Bloomfield company, adding to the old allegations supplemental averments of the passage of the Débris Commission Act and the failure of the company to submit itself to the jurisdiction of the commission and to secure from it a permit to conduct its mining operations behind its dam. While conceding that the mine was being operated without injury to the navigable streams, as found at the former trial, Judge Erskine Ross nevertheless granted the injunction, holding that until the Débris Commission appointed under the act should find that such mining can be carried on without causing the prohibited injury, all hydraulic mining within the territory drained by the Sacramento and San Joaquin river systems is unlawful. This decision was afterward affirmed on appeal to the Circuit Court of Appeals.

Thus was the constitutionality of the act as a quasi-police regulation upheld in favor of the United States and against a hydraulic mine. Of course, there was never any practical doubt that the government had the constitutional right to appropriate money, or to build dams, to keep débris out of its navigable streams, but this decision also decided that it had the right to require that a hydraulic mine, admittedly being operated without material injury to the navigability of a river, must submit itself to the jurisdiction of a commission having in charge the administration of a federal act for the supervision and protection of that navigability. Such a test of the constitutionality of the measure, on the point indicated, was, however, of no practical benefit to the miners.

Decision of Judge Ross

The single comforting dictum in the whole decision of Judge Ross is the following:

> "The power to absolutely prevent the use of such waters for the objectionable purposes necessarily includes the power to prescribe the terms and conditions upon which they may be so used." (81 Fed. Rep. 254.)

Taken in connection with the facts of the case, however, this language would simply mean: "The power to absolutely prevent the use of such waters for the objectionable purposes necessarily includes the power to prescribe the terms and conditions without which they may not be so used." That decision simply decided the constitutional right of the government to protect the navigability of the streams by closing down, through legislation, any hydraulic mine in these watersheds which had not submitted itself to the jurisdiction of the commission, irrespective of the question whether it was committing any material injury to the navigability of their streams or to the lands adjacent thereto, and that the miner would not be heard to say, in resistance, that he was thereby being deprived of his property without due process of law. *That was settled, but that was all that was settled by the decision.* For a miner

to herald out a decision like that as being one in favor of the constitutionality of the act was to be guilty of self-deception. The miner was bound with hooks of steel to get a permit. What was the permit worth to him after he had got it?—that was the question. Clearly, that question could not be settled in a case where a mine was not operating under the act, but could only be determined in a case where a mine was operating under a permit from the commission, and where a farmer, a county, the state, the government, or some other aggrieved party complained of it. Two practical questions in such a case would be involved.

First, Was the permit of the commission conclusive?

Second, If conclusive, was the act making it conclusive constitutional?

Commission's "Permit" Not Conclusive

Obviously, if after it had been obtained from the commission a permit was not a finality, but could be set aside by an injunction, or interrupted by a mere restraining order, from the Superior Court of Sutter County, or any other anti-débris county, and if, where the evidence on the question of the materiality of the injury was conflicting, the injunction or order of the lower court would not be interfered with on appeal, under the well-known rule, then the permit need not be worth the paper it was written upon. After the holder of a permit had deeded away his right to mine except under the jurisdiction of the commission, and after he had spent enormous sums in the building of dams and other restraining works, if his permit was not held to be conclusive, then, palpably, he was worse off than if he had never applied for a permit at all. Such a permit would be a mockery to the miner. If, on the other hand, the permit was construed to be a finality under the language of the act, and the Supreme Court should hold that the act giving such power to the commission in this respect was unconstitutional, then his permit was of no more use to him than if it had been decreed in the first place not to be conclusive.

The settlement of the question was of supreme importance to the hydraulic mining interest in these two river basins—was vital to the continuance of the industry on any inviting scale under the act.

Mine after mine was closed down, and no miner appealed.

Jurisdiction of State Courts Maintained

The California Miners' Association, which had championed the miner's cause, disbanded; the industry went dead. It was not until Jan. 23, 1908, that the point was decided, and when the decision finally did come it came with a bang, in the case of County of Sutter *vs.* William Nichols, reported in the 152 Supreme Court Reports, page 688. The opinion was unanimous. It did not have to consider the second question above stated, because the decision of the first point eliminated and wiped out the second. Here, after all the tomtoming about what the enforcement of the débris dam provisions of the act were going to do for the miner, was the pitiful result, as summarized in the official syllabus of the decision:

"The jurisdiction of the state courts to enjoin a nuisance caused by persons engaged in hydraulic mining permitted by the California Débris Commission, established under the Act of Congress of March 1, 1893, under the restraining works constructed by the consent and approval of the Commission, but which have proved insufficient to restrain the débris, which had been deposited upon lands belonging to the plaintiff County, to the great injury of its property, is not affected by the action of such Commission pursuant to said Act of Congress.

"It is essential, in order to make the action of a special tribunal in the matter of improvements conclusive, that the thing to be accomplished shall be a matter of public concern and for the public benefit. The action of the Débris Commission is not judicial or conclusive, since the business of mining for the benefit of the mine owner is a private affair, carried on by him for his own personal profit."

While the permit of the commission is not conclusive, the decision of the Supreme Court is. The miner at last knows where he stands under the provisions of the act. And it would be trifling with common sense and insulting to his intelligence to tell him now that there would be any greater sanction to a permit where the government built and paid for the dam than where he built and paid for it under the approval and direction of the government. This committee would be infidel to the true interest of the miner if it suggested such a thing.

With these sober facts before him the practical miner would have little patience with the renewal of an agitation to attempt the rehabilitation of hydraulic mining itself under the auspices of the commission. He now knows he would "get nowhere" by it. With the romance and rainbow provisions eliminated from consideration, there remains, however, a very important service which the commission can perform: it can cut out the camouflage and make it, for the time being, as far as hydraulic mining is concerned, a fact-finding commission on new engineering and hydraulic data. The commission itself has not been in default. It possesses the confidence of the community as to its integrity and its ability. Ask it to do only what the law will let it do.

Cloudman Act Starts Investigation

At the last session of the State Legislature an act was passed, approved May 18, 1925 (Chapter 207 of the Statutes of 1925), appropriating $10,000 and creating a commission to consist of the state mineralogist and the surveyor general, to investigate the feasibility of any plan or plans whereby hydraulic mining operations can be resumed in this state, and to report its findings and recommendations to the next session of the legislature. That commission has sought the co-operation of the Federal California Débris Commission in its work. Here is something practical. The idea is to have an authentic survey of all the unknown quantities of the equation, in regard to areas, extents, topography, engineering, and water, before trying to formulate or advocate any plan of actual mining operations. The California Débris Commission would be willing to co-operate in this work, and in doing so would not be attempting to do what the courts will not permit it to do. The mining industry would itself then come into possession of authentic data, upon which to formulate any possible plan upon which it might approach the Federal Government with some confidence of obtaining practical results. No matter what may be the ultimate result of this effort to get the feet of the industry on the ground, the only real progress that will be made for the present will be to endeavor to have the California Débris Commission co-operate as a fact-finding commission in this state legislative proposal.

The report is signed by John F. Davis, chairman, Lloyd L. Root, and Robert I. Kerr.

Limestone for Portland Cement in Greene County, N. Y.

By Robert W. Jones
Mining Engineer, Catskill, N. Y.

Robert W. Jones

THE LIMESTONE deposits of Greene County, N. Y., have become important because of the use of the product in the manufacture of portland cement. Availability of water transportation into the New York City markets and of rail transportation into other large consuming centers has been a favorable economic factor.

Several cement plants operate in this territory. The first plant was that of the Catskill Cement Co. Later the Alsen American Portland Cement Co. and the Seaboard Cement Co. erected plants but made no production. The Catskill plant is now operated by the Alpha Portland Cement Co., and the Alsen plant by the Lehigh Portland Cement Co.; and until recently the old Seaboard plant was operated by the Acme Portland Cement Corporation. Production of limestone in this territory is limited not only by area and thickness but by geological conditions that have not always been recognized. Failure to recognize these geological conditions has brought a heavy expense to various companies working in this field.

Practical Importance of Geologic Conditions

The limestones, which are of Helderberg age, lie upon the upturned alternating shale and sandstone beds of the Normanskill age. They rise suddenly from the glacial clays near West Camp, forming a long narrow ridge that extends in a general northeasterly direction to the southern limits of the village of Catskill, a distance of approximately six miles. The ridge varies in width from a few hundred feet to approximately one mile. Erosion has had its usual effect; and because of folding and faulting as well as the varying percentage of lime in various strata, the quarry foreman and chemist have had a busy life. This ridge, known in the early Dutch records as the Calc Bergh, lies east of another known as the West Bergh, which is also of the same formation, though on a smaller scale.

Physically the Helderberg limestones consist of the Manlius, which is usually high in magnesia and silica and of little use to the producer of cement, followed immediately overlying by the Coeymans, a massive fossiliferous high-lime bed. This is not of commercial importance, owing to its position in the series. This is followed by the New Scotland, a highly fossiliferous limestone of comparatively great thickness. This weathers rapidly and is rather high in magnesia. Above the New Scotland comes the hard massive shaly beds known in the early days as the Encrinal limestone. This material is very hard, and has been used to some extent as a substitute for clays to provide silica and alumina in the manufacture of cement.

Next is Becraft limestone, the main source of supply of lime for cement manufacture. It is a massive, pinkish material, fairly regular in lime content, running around 95 per cent calcium carbonate. It requires considerable block-holing in quarrying and is easily crushed. Above these beds comes a series of siliceous limestones very similar in appearance to the New Scotland beds. These are known as the Port Ewan limestones. Above these siliceous limestones occur the very hard, flinty, siliceous fossiliferous beds representing the Oriskany. This rock is very hard, a 6-in. churn drill making only about 3 ft. in ten hours. Above this formation comes the Esopus sandstone.

Throughout the length of the ridge there has been developed an almost parallel series of anticlines and synclines passing westward from the east face of the

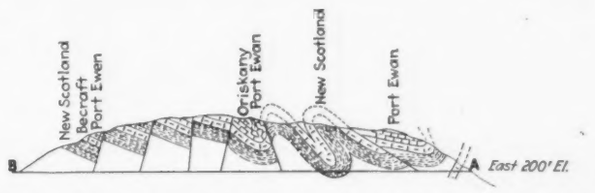
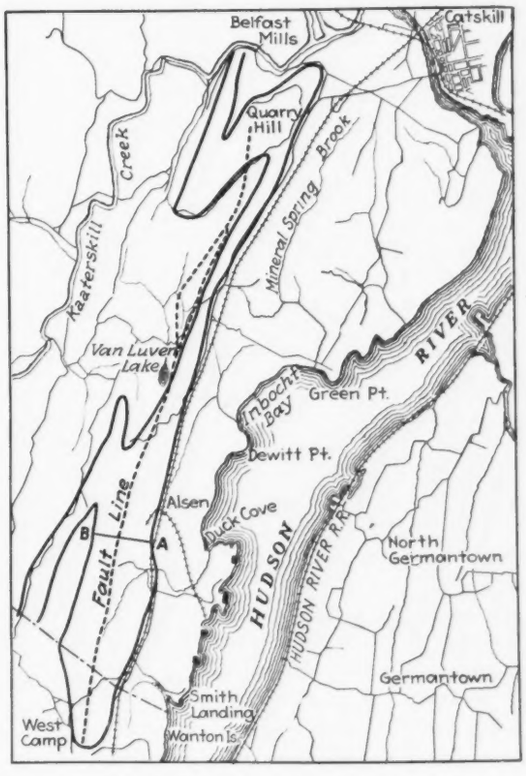


Fig. 1—Typical section showing the folding of the strata, with resulting problems in quarrying operations

ridge into a series of parallel faults. This is the general scheme of the displacement; however, it is altered locally to such an extent that it is sometimes hard to recognize the actual conditions. The accompanying photograph, showing the underlying Normanskill beds, indicates what, in a general way, has happened to the overlying limestones. These disturbances result in the formation of two workable areas. Generally the area east of the main faulted area is much overturned and displaced both horizontally and vertically by faults and folds, so that quarry operations are seriously limited.



Map of part of Greene County, N. Y., showing the limestone area and fault lines

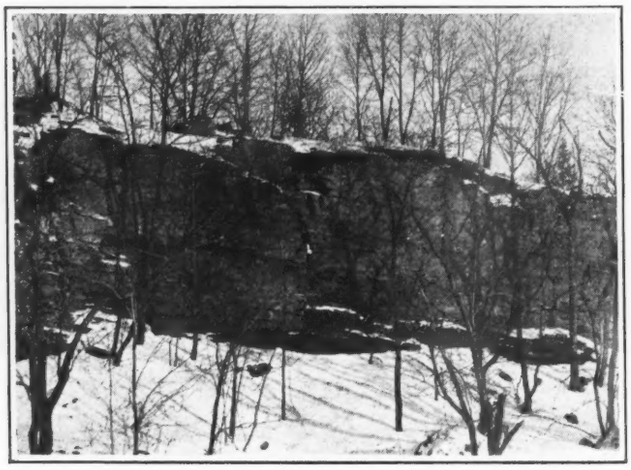
Outcrop of Normanskill lime, showing displacement of the beds

In some locations the folding has been so severe that a natural mixture of high and low lime has resulted that is satisfactory to the chemist.

Folding of the Strata

Fig. 1, which is a section through the southern part of this ridge, illustrates what the quarry foreman must contend with. This is an actual condition as shown during the opening of one of the quarries in the early days; it represents a section through the two areas east and west of the main line of displacement. To the west of this line there has been very little horizontal movement, the fault blocks being displaced in a definite manner. There is one peculiar condition in regard to this faulted area: the faulting evidently has taken place prior to the general glaciation of the region, only a comparatively short time ago. This line of displacement passes west of the village of Catskill at a distance of about one mile. During the earthquake of Feb. 27, 1925, the shock was felt severely along this line. At the time of this earthquake there were quite a few breaks in the water system of the village, all due to pipes being pulled apart. The photograph showing snow on the ground illustrates one of the larger displacements of this area, depicting an exposure through the entire Becraft beds and the upper Encrinal beds.

To the south of the section as shown in Fig. 1, the limestones narrow to a width of several hundred feet, represented by a sharply folded and faulted syncline. To the north of this section the limestones are narrowed to a belt in which, in some cases, there is not more than 50 ft. of Becraft available. This belt extends for a distance of nearly three miles. The west face of the belt is faulted sharply against worthless New Scotland or Esopus. This extends further north into a low, folded syncline that again brings to the present surface the productive beds, and then passes westward into a northward extension of the faulted area, as shown in Fig. 1, and finally into a low anticline.



Showing an unusually large throw along the main fault line

Underground Mining May Be Profitable

The western leg of this eroded anticline is shown in the West Bergh as highly inclined beds of the entire Helderberg series. The narrow three-mile ledge cannot be brought under production by quarry methods. To the west of this ledge, however, test holes indicate that the entire series of limestone beds is present below the Esopus sandstone at an elevation that would make it very convenient for mining and transportation. There are no indications of serious disturbances, and a good roof is present in the hard limestones of the Port Ewan. This leaves a workable face of about 60 ft. of high lime. The ground-water level is low. Of twenty-five holes driven to a depth of 100 ft., only one carried water in any serious quantity.

A Wet Method for Determining Silver in Lead

When cupellation is impracticable, silver may be determined in lead by the following procedure, according to B. S. Evans in *The Analyst* (Vol. 51, p. 79) abstracted in *British Chemical Abstracts*. To 50 grams of metal dissolved in nitric acid, ammonia is added until the solution is alkaline, followed by acetic acid until just acid, and the liquid is boiled for two hours with a coil of copper foil. The precipitated silver and excess of copper are filtered off, washed with hot water, and redissolved in nitric acid. The solution is made just alkaline with sodium hydroxide and again acid with hydrochloric acid, adding a slight excess of the latter to precipitate all the silver. After boiling for fifteen minutes, the solution is kept overnight and filtered. The precipitate is dissolved in 10 to 25 c.c. of 1:1 ammonia, the solution diluted to 200 c.c., an excess of standard potassium cyanide solution added, followed by a few crystals of potassium iodide, and the excess cyanide titrated with a standard silver solution as in the case of nickel.

Dangers of Blasting in Heavy Sulphides

Large amounts of sulphur dioxide may be generated in blasting in heavy sulphides, particularly in dry working places where dust has settled on the walls. There also appears to be danger from sulphide-dust explosions when blasting in such places, according to U. S. Bureau of Mines *Reports of Investigations*, Serial No. 2,739. The deadly gas hydrogen sulphide is also likely to be produced in blasting in heavy sulphides. Water in drill holes appears to increase the amount of hydrogen sulphide generated when blasting in such places. Ventilation currents should be arranged so that there is no possibility of men getting caught in gases from blasting in ground of this mineral character.

Checking Bullion Against the Ore Assay

Chance of Error in the Necessary Estimations of Tonnage and Value Make Accurate Monthly Balance Sheets Impossible in Most Gold and Silver Mills

By William Johnson Kemnitzer
Bakersfield, Calif.

W. J. Kemnitzer

THE PRACTICE of checking bullion against the ore assay in a cyanide mill has many limitations. That is to say, in multiplying the tonnage of ore milled by the average assay value of that ore in an effort to compare this product with the total value of bullion plus tailing, many restrictions discount the usefulness of such a check, nor is it possible to determine any exact mathematical relationship between bullion and the ore assay. The reasons are sometimes not wholly understood by non-technical persons interested in the accounts of a mine, and it is not infrequently that some misinterpret the check or misuse the figures. The accountant who desires to keep his books straight has his troubles. The real importance of the check is to act as a guide to the operating staff. When large discrepancies occur, either the factors and methods for determining the balance are wrong, or valuable metals are actually being lost. It is not possible to determine the true amount of the lost values unless the factors and methods used in their determination are correct, and because these are not likely to be correct the significance of the check is limited.

Following are a list and analysis of the data needed in an equation to check bullion against the ore assay:

A. Tonnage of ore fed into mill.

B. Average assay value per ton of ore fed into mill.

C. Tonnage of ore tied up in mill at beginning of period.

D. Average assay value per ton of ore tied up in mill at beginning of period.

E. Value of bullion (Oz. Ag $\times$ price per oz. Ag) (Oz. Au $\times$ \$20.67).

F. Tonnage of ore tied up in mill at end of period.

G. Average assay value per ton of ore tied up in mill at end of period.

H. Tonnage of tailing.

I. Average assay value per ton of tailing.

J. Total value of precipitate, bits of bullion, slag, concentrates, amalgam, and other material left over from monthly clean-up.

Providing the above data were correct, the following equation could be made:

$$(A \times B) + (C \times D) = E - (F \times G) - (H \times I) - J$$

Suppose the check is to be made over monthly periods. First, the tonnage of ore fed into the mill, A, must be known. Unless the ore is correctly weighed and the proper correction made for the moisture content, considerable error may result. Perhaps the most accurate method of weighing ore is with a carefully calibrated automatic scale in the crushing plant. However, few small mills are thus equipped, and the usual method is that of weighing the cars of ore on a platform scale before the ore is dumped into the mill bin. The mill bins act as reservoirs for the ore to be treated, so the actual tonnage delivered to the bins during the month is not necessarily the amount fed into the mill. The tonnage of ore in the bins at the beginning of the month plus the tonnage delivered must equal the tonnage fed into the mill plus that remaining in the bins at the end of the month. The tonnage of ore in the bins at any particular time is usually weighed indirectly by the use of a factor for the average weight of broken ore occupying any certain cubic unit of space. The ore in the bin is leveled off, its volume measured, and multiplied by the factor, but with ores of variable specific gravity it is practically impossible to gage accurately the weight of ore remaining in the bins. When no kind of weighing apparatus is used, a constant weight is usually assumed for each car of ore delivered. A monthly tonnage figure thus secured is an estimate that is little better than a guess.

When the grade of ore is high, it will take but a small error in tonnage to interfere seriously with the check. For example, an error of 10 tons a day in ore worth \$30 a ton could unbalance in a month by \$9,000 the equation sought for, which might be a matter of great concern to those who did not understand the limitations of the factors and methods used. Such a situation does not always result, for the daily mistakes in tonnage may be compensating; at other times the error may be to the good. On the other hand, the error may be a constant one through continual application of a faulty factor, weighing apparatus, or the personal element. It is important to know when the tonnage figure is reasonably correct and when it is not. Certainly, no great reliability can be placed on the figure unless every pound of ore fed into the mill is carefully weighed, a correction made for the moisture content, and the correct deduction made for ore remaining in the bins.

It is possible to determine the tonnage treated by taking the specific gravity of slime pulp and the cubic capacity of sand. This is an indirect method, involving the use of many variable factors, and much of the personal element.

The average assay value per ton of ore fed into the mill, B, is best obtained on a sample that has been taken by an automatic sampler. Since a representative sample cannot be secured from ore that has already been crushed in cyanide solution, the sampler should be placed to scoop a uniform amount of dry crushed ore as it passes into the battery box or ball mill. The sampler may operate continuously or over equal intervals of time, depending on the consistency of the grade of ore. Ores not finely crushed and of erratic grade must necessarily be sampled more often than otherwise. The automatic sampler eliminates the per-

sonal factor, but in actual practice these automatic devices are not often substituted for the human agent. Sampling is usually considered a boy's job, and with it goes a boy's reliability. Intelligent and significant sampling requires care, patience, and good judgment.

The monotonous routine of collecting, day after day, a large amount of ore in small bits during a twenty-four-hour period soon wears on the sedulity of ordinary samplers. At the end of the day the bulk of the intermittent samplings may have reached a ton or more, depending on the tonnage crushed and the character of the ore. Such a mass must then be quartered and assayed. Not only may the actual average value of the bulk sample itself not be truly representative of the ore from which it was taken, but opportunities for error also exist in the quartering down and assaying

It is difficult accurately to estimate the tonnage of ore tied up in the mill at the beginning of the period, C, and at the end of the period, F. Part of the ore is in the tanks in the form of sand or slime, and other smaller parts are in circulation in conductor pipes, or in ball mills, tube mills, filters, on concentrating tables, or the like. Under the circumstances of distribution within the mill, it is not possible to gain access to every bit of the ore and certainly not to weigh it. The net dry weight must be indirectly computed from specific gravity and cubic capacity tests, which tests, in themselves, are liable to great inaccuracies. It is not likely that these tonnage figures will closely approximate fact except by accident.

It is likewise practically impossible to sample with any accuracy and assign a true average value per ton to all ore that is tied up in a mill at any particular time, D and G. In sampling slime or sand on which cyanide solution is acting, it is necessary to stop that action as soon as the sample is taken. Even after immediate and thorough filtering, washing, and drying, it is a question whether or not the assay is truly representative of the ore. The assay value of the solution which constitutes a part of the pulp, as well as solution drawn from precipitation, must be considered. Also, it is necessary to know the volume of solution on hand, and in the case of pipe lines bearing solution this figure is not easily ascertained.

The tonnage and assay values tied up in a mill at the beginning and end of a month become important factors if the tonnage treated during the month is low or if the grade is erratic.

Under proper supervision, and by the use of standard methods of analysis, the value of bullion, E, and the value of precipitate, bits of bullion, slag, concentrates, amalgam, and other material, J, may be determined with accuracy.

The tonnage of tailing, H, is determined by indirect methods. The amount of sand residue is usually estimated by multiplying the cubical capacity of the container (tank or car) by a weight factor, representing the net weight of dry sand to occupy a cubic unit. Considering that (1) the ore may be of variable specific gravity, (2) the moisture content is not constant, (3) the density of the mass will vary, and (4) an exact cubical measurement of the sand may not be made, it is likely that considerable error will result in this tonnage figure. The tonnage of slime residue may be measured similarly to the sand, by rate of discharge from a continuous filter, or by subtracting the amount of sand from the total tonnage milled, depending on the system of treatment. In any case the weight of dry residue is estimated indirectly, with liability of great error.

The average assay value of tailing, I, may be secured fairly accurately because it is in a finely divided and homogeneous state. The sand tailing may be cored while still in the leaching tanks, or grab samples may be taken as the tailing is drawn or sluiced from the tanks. Samples of slime tailing may be taken with an automatic sampler, or by grab sampling of the filter cake. Especial care must be taken with tailing containing cyanide solution as moisture.

To sum up it may be said that: (1) the amount and assay value of bullion, E, J, and tailings, H $\times$ I, are the most reliable figures in the check of bullion against the ore assay; (2) the accuracy of the amount and value of ore fed into the mill, A $\times$ B, is dependent on the care and methods used in their determination; (3) the amount and value of ore tied up in the mill, C $\times$ D, F $\times$ G, are likely to be in error regardless of the care and methods used in their determination; and (4) it is not possible to know just what ore, that was fed into the mill, went to make the bullion and tailing for the month under consideration.

From the conclusions above set forth it might appear that the check is of little significance, and to make the effort to compare bullion with the ore assay is merely a waste of time. The answer is, that the check is significant only to those who thoroughly understand its limitations. In my experience I have known persons who have persistently endeavored to discover petty thievery, and to establish an accountant's balance with the figures. To attach such importance and reliability to the check is not to understand the principles of technical deduction. There can be no commercial application of the check, and in most instances the figures probably do not hold any economic importance whatsoever. On the other hand, it would be poor engineering practice not to compare actual bullion recovery with anticipated production. Within economic limits, every effort should be made to secure reliable data on the monthly mining and milling situation. Over longer periods (six months or more) the check should nearly balance, and, when intelligently used, can be of great technical assistance.

Determination of Precious Metals in Anode Slime

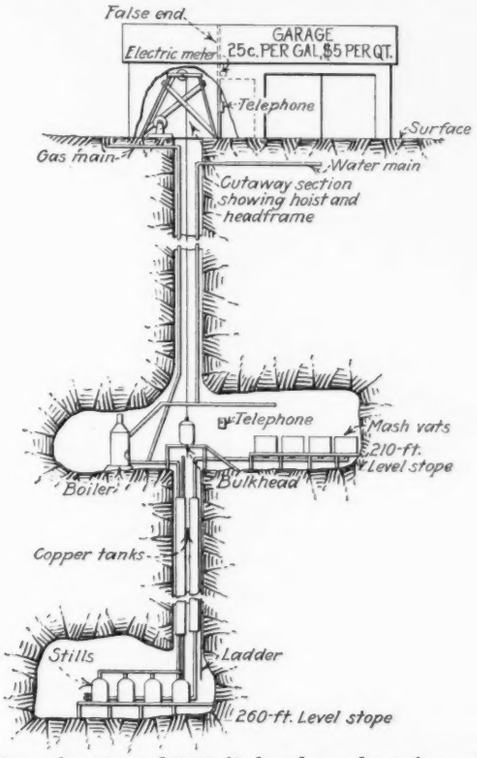
E. Eckert describes the determination of silver, gold, and platinum in anode slime in *Metall und Erz.* (Vol. 25, pp. 595-8) abstracted in *British Chemical Abstracts:* Ten grams of the slime are dissolved in nitric acid, and, after removal of the insoluble matter, the silver is precipitated with hydrochloric acid and the chloride is weighed. Gold and platinum are determined by scorification and cupellation. The silver bead is dissolved in nitric acid, leaving a residue of gold and most of the platinum. The silver is precipitated as chloride from the solution and the filtrate evaporated to dryness on the water-bath. Then the residue is dissolved in hydrochloric acid and the solution transferred to a lead capsule, in which it is again evaporated. Capsule and residue are cupelled with the major portion of the platinum and gold and with sufficient silver for the subsequent parting. The bead is parted in sulphuric acid and the residue ignited and weighed. It is then re-alloyed with silver and the bead parted in nitric acid; this is repeated until the gold residue is of constant weight. Platinum is found by difference.

A New Use for an Old Mine

Federal Agents Find Distillery Installed in Abandoned Workings of Zinc and Lead Property in Oklahoma

By Charles F. Williams
Geologist, Miami, Oklahoma

THAT worked-out mines are not necessarily non-producers was demonstrated when federal agents discovered a whiskey still in an abandoned mine in the Picher mining area of the Tri-State lead and zinc district last winter. The collar of the hoisting shaft was cleverly concealed in a private garage having a false end, with a secret door leading into the hoist room. A headframe, electric hoist, bucket, and telephone booth completed the surface equipment. A second shaft connecting the mine with the surface was inclosed with a high board fence built presumably to prevent passers-by from detecting fumes from the operations below, the shaft being upcast. The distilling plant had a third entrance; an underground drift connected it with other mine workings, but this drift was closed by water to normal underground travel.



Section of 210- and 260-ft. levels and surface plant

The orebodies in this area are flat lying and irregular in outline. The occurrence of ore lenses at two levels separated by several feet of barren country rock is not uncommon. The hoisting shaft at this mine cut two such ore deposits which, when stoped out, left two ideally arranged rooms for the installation of a distillery.

On the first level, down 210 ft. from the surface, the mixing plant was installed. The equipment on this level consisted of four wood-stave tanks, having a total capacity of 40,000 gal. of mash, a steam boiler, and gas heating stoves. Considerable raw material was stored on this level also. Entrance to the distillation plant on the 260-ft. level, was gained by a ladderway in the shaft. The equipment in the lower stope consisted of four stills having a capacity of 4,000 gal. The workings were lighted by electricity and connected with the surface by telephone. Secret connections had been made with gas, water, and electric lines. The section of the shaft below the 210-ft. level contained two long copper storage tanks protected by a bulkhead at this level.

The enterprise is believed to have been in operation for several months. It is said that the production appeared under the whole gamut of labels known to those in this country who will tempt gastritis with "The little miracle of liquid flame that evens man with God."

Collar of shaft, hoist, and bucket

The "white mule" produced should not be confused with other varieties of mules found in the mines of the district, though the same grade of corn may be used in the production of both. An obvious advantage of a plant such as that described is that mine water is freely available as a raw material, such water having more body and flavor than ordinary supplies possess, and also usually being sufficiently colored so that prune juice may be unnecessary as an additional reagent.

The Mills-Crowe Process of Cyanide Regeneration

A patent has recently been issued in England on the Mills-Crowe process of cyanide regeneration, developed at the Santa Gertrudis and Fresnillo mills of The Mexican Corporation. The patent, which is No. 241,669, 3.9.24, is abstracted by *Chemistry and Industry* as follows:

Spent leach liquor containing cyanide is agitated in a closed vessel through which air charged with sulphur dioxide is passed. When the liquor becomes acid it is pumped into the top of a closed vessel on to a distributing plate, and thence falls through a series of perforated baffle plates in a finely divided shower while a rapid current of air is passed upward through the vessel to remove the hydrogen cyanide from the solution. The air containing the hydrogen cyanide is passed upward through a similar vessel through which a shower of an alkaline liquor is constantly falling, whereby the hydrogen cyanide is absorbed, with the regeneration of alkali cyanide for further leaching operations. If the original liquor contains copper, hydrochloric or sulphuric acid must be used to liberate the hydrogen cyanide and the acid liquor may be treated for the recovery of copper by known methods.

Useful Operating Ideas

Straightening and Bending Devices

A simple device, designed and constructed in the shops of the Argonaut Mining Co., at Jackson, Calif., and used for straightening stamp stems or for bending pipe, is shown in Fig. 1. The base of an old mortar box, cut down to a convenient height, affords a solid

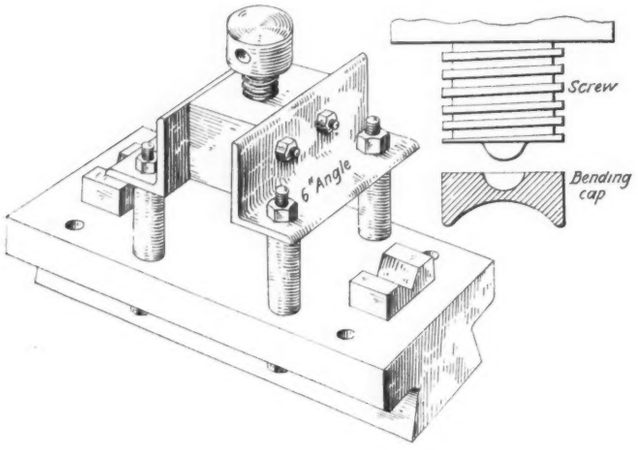


Fig. 1—Shop rig for straightening and bending pipe or rods

table, and the bolt holes enable the pressure screw to be shifted where convenient. A cast-iron screw block is bolted to two short lengths of 6-in. angles, and these in turn are held down by four bolts passing through short lengths of pipe as shown in the sketch. V-blocks are used to support the object to be either bent or straightened. A cap is placed on the end of the screw, which protects the surface from injury and gives a firm bearing for the screw.

For bending plates used in the repair of mine cars, two pairs of bending rolls are shown in Fig. 2. The plate to be bent, after being cut to dimensions and punched, is slipped between the rollers and bolted to angles on either side of the bending rig, as shown in the sectional view. The lower rollers, which are carried in a frame swinging concentric with the large stationary roller, are drawn up by a chain block, bending the ends of the plate to an upright position. By removing the bolts the bent plate can then be lowered and removed.

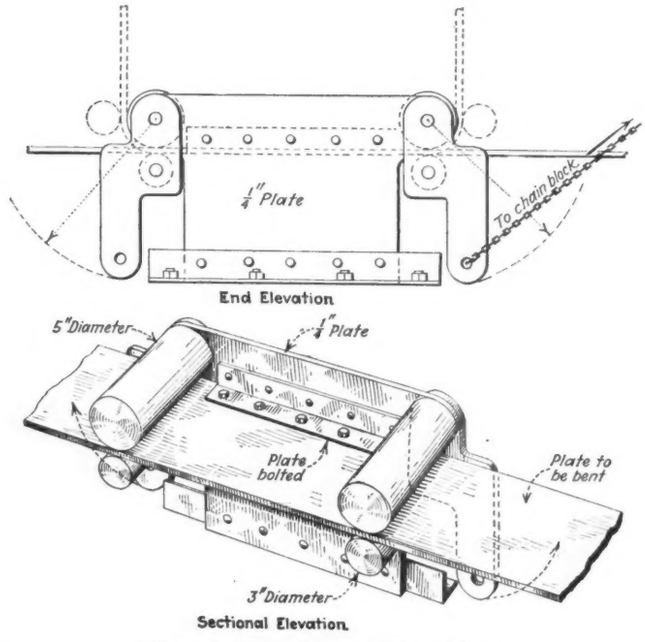


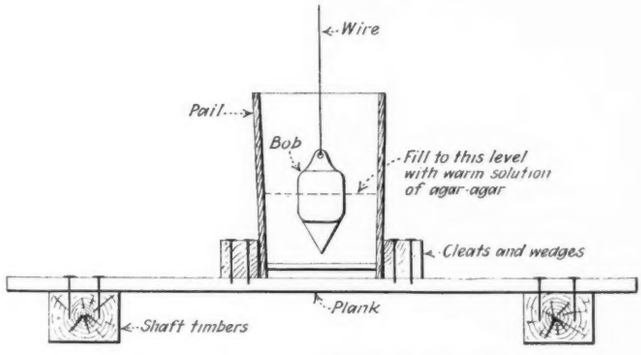
Fig. 2—Rig for bending plates

Maintaining Shaft-Plumbing Bob in Position

By Edward K. Judd
Mining Engineer, Palisade, New Jersey

As a means of avoiding the tiresome and painstaking process of determining the mean position of a swinging shaft-plumbing wire, and the usually inconvenient or unsatisfactory methods for fixing it in that position, when found,[1] the following suggestion is offered:

After suspending the wire, with the customary precautions to insure that it is free and as little affected



Method of fixing plumb bob in shaft surveying operations

as possible by air currents and falling water, set an empty can or a small pail on a firmly fastened plank and adjust its position, as shown in the accompanying sketch, until the plumb bob just clears the bottom and all sides; a large amount of clearance is not necessary, but it is important that both the pail and the plank are rigidly fixed. Then pour into the receptacle a sufficient amount of a warm solution of agar-agar, previously prepared in another vessel, to submerge about the lower half of the plumb bob. Suitable proportions are about 1½ oz. of agar-agar to 1 gal. of water, and the mixture must be boiled for a few minutes to insure complete solution. On cooling, the liquid passes gradually through stages of increasing viscosity, ending at ordinary temperature as a jelly sufficiently firm to hold the

[1]Peele's "Mining Engineers' Handbook," p. 1247.

plumb bob quite rigidly in its mean position, at which it will slowly come to rest. If water is falling in the shaft, the solution must of course be protected against splashing and excessive dilution by a split cover having a small hole at its center.

Agar-agar costs about $1.50 per pound at wholesale and about three times as much in drug-store quantities. If much of this work has to be done, the jelly can be dried (it is not sticky or mussy to handle) and used over again. I have not now the facilities for making a practical test as to the accuracy of this proposed method, but it seems that it should compare favorably in many respects with present methods.

Car Locking Device for Shaft Cages

By A. J. Keast
Connaught Station, Ontario

Surface and underground shaft station plans at the mine of the Night Hawk Peninsular Mines, Ltd., Connaught Station, Ontario, Canada, are shown in Fig. 1. The station plan provides for the approach of loaded cars on one side of the two-compartment shaft and the removal of the empties on the opposite side. At the surface the loaded cars are removed on one side and the empties are brought in on the opposite side and move on to the cages.

The device for holding the car upon the cage is shown in Figs. 2A and 2B. The locking device consists of a ½-in. plate attached to a 1½-in. shaft on either end of which is a throwing device. The plate is of sufficient length to enter between the axles of the car as shown in Fig. 2B. On the ends of the cage at a height of 2 ft. 9½ in. above the rails are cross bars as shown in Fig. 2A.

Previous to the installation of this device, which was the idea of our present blacksmith, and of the underground track layout and the surface arrangements, which were the outcome of several employees' ideas after the matter had been discussed, the capacity of this shaft, operating two eight-hour shifts per day

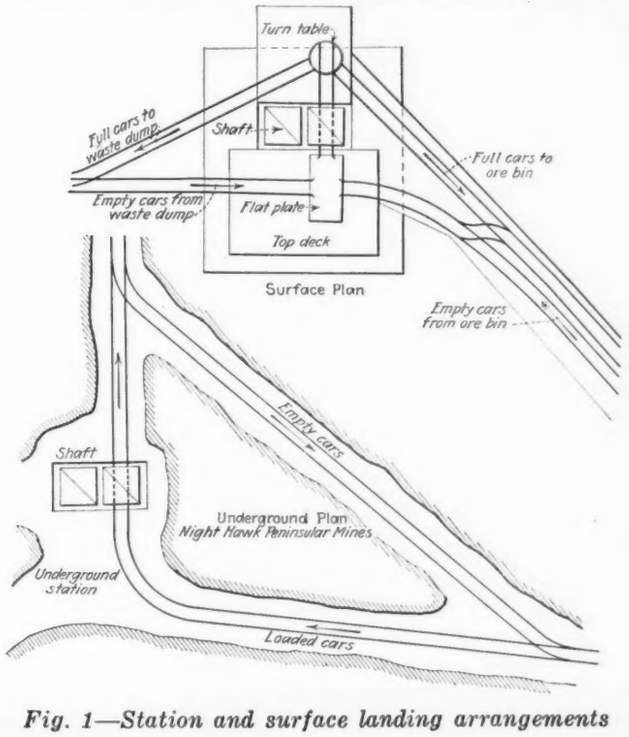


Fig. 1—Station and surface landing arrangements

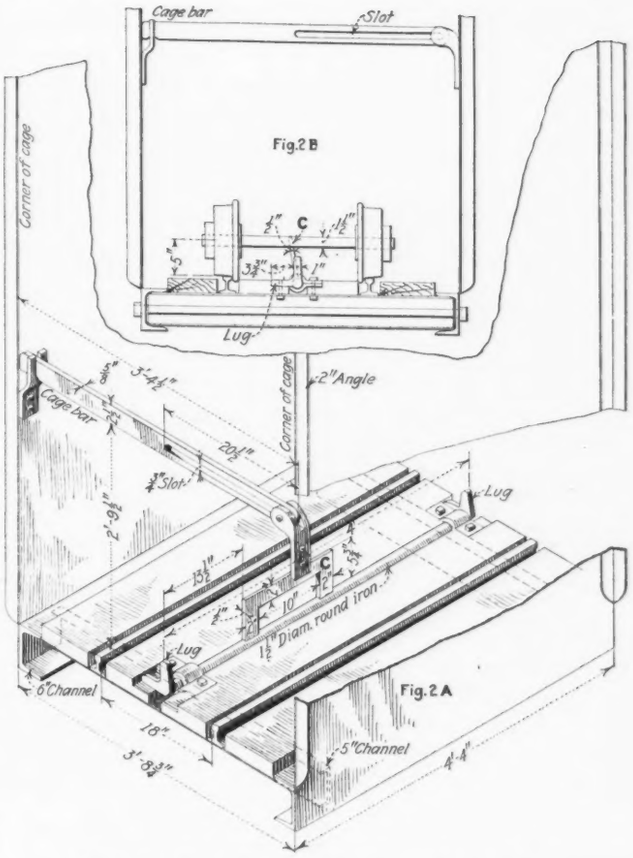


Fig. 2—Cage locking device and cage bars

and using cars of 1,400-lb. capacity, having at the same time to hoist men and steel and other supplies through the one compartment, was 4,500 tons per month of twenty-six working days. At present, using the same cars, the capacity of the shaft and equipment is 7,800 tons per month. The speed of operation is such that the empty car can be removed and the full car placed on the cage at the loading station in three seconds and the full car removed and the empty placed on the cage on the top deck in four seconds.

When hoisting, the bars on the cage hang upright along the side of the cage. This is effected by means of the long slots cut in the cage bar. The car is held in position by the square arm, C, between the car axles. This arm and the operating bar to which it is attached is so constructed that there is no possibility of its becoming disengaged from between the car axles, its center of gravity being on the same side as the two heavy operating lugs (see Fig. 2B).

The protecting bars on the shaft on the side on which the car leaves the cage are high enough for the car to pass under when they are in place and yet low enough for safety. An additional safety bar, placed halfway between the rail and this high bar, is lowered into place when no hoisting is being done. The cage tender at the loading station has the minimum amount of work to perform, and the topman has time to switch the full cars in the direction of the ore bins or the waste dump, as the case may be, during the time the cage is descending for another full car.

This arrangement, in addition to its safety features, gives a continuous supply of cars. The shaft layout in Fig. 1 prevents congestion of traffic by bringing in the empties from the same sides, at all times.

Discussion

Adopting the Metric System as Standard

THE EDITOR:

Sir—In "Discussion" in the issue of April 24, 1926, Mr. J. A. Thomas, of Los Angeles, Calif., concludes his comment on the ever-recurring subject of the adoption of the metric system as the standard system of weights and measures for the United States, with the statement that he "has yet to find a valid argument against the adoption of the metric system except that of expense in making the change, etc."

Many years ago, possibly before Mr. Thomas was concerned with such a subject, a committee of one of the engineering societies investigated thoroughly the use of the metric system in European countries where it had been "adopted as a standard." The report of this committee as well as the reports of other committees and of learned individuals who concerned themselves with this subject in the past was diametrically opposite Mr. Thomas' opinion: they could find no valid reason for its adoption as a standard.

The system was imposed on France by Napoleon, who named it as the "standard" of that country at a time when his will was the law and who generally managed to have his laws obeyed to the letter. In spite of his autocratic ruling and the adoption of the metric system as the standard of France, our engineering committee found that practically every line of real industry in that country had its own system of weights and measures and that the barley corn, hand, ell, and other ancient and honorably derived units of measurement were still in daily use.

We have in this country a standard of weights and measures in both our prevalent systems and the metric system as well. Why should one attempt to "standardize the nation" and demand that only one system should be used? Is it not better to go on as we have been doing, letting such industries as may find that the metric system is preferable to other systems for their own peculiar uses use it if they so desire and let those industries which find the older systems preferable continue to use them. There is no reason why any industry should be hampered by being forced to revise its system of weights or measures, although laws hampering industry of every kind seem just now to be popular with our alleged statesmen, the tendency being to pass as many new laws as possible for the regulation (?) and hampering of other people's business and to evade those laws governing one's own business. In addition to our numerous legislators in every state in the Union, we have unfortunately a number of individuals who have time on their hands for which they have no other use than to endeavor to change the existing order of things, usually of no real benefit to the person so endeavoring, or to anyone, but merely to gratify the whim of an idle and usually narrow mind.

From my "years of practical experience" (to paraphrase Mr. Thomas) I believe that when the metric system becomes necessary to any line of industry in this country, that industry will adopt it, not by a local law, a state law, or a national law, but simply by "absorption." The metric system will, when needed, or when it proves better for any one purpose than the system in previous use, replace the previous system without even that particular industry being disturbed. The beginning may be small and the progress slow, but just as certainly will the change be accomplished. That few American industries have been so affected is proof enough that the "adoption of the metric system as a standard" is entirely unnecessary. To so "adopt" the metric system would be merely to "cumber the records." Those industries which are using the metric system would continue to do so and those which are not using it would continue on in the even tenor of their way, using those systems to which they are accustomed. No one would be benefited one whit, jot, or tittle, except possibly the crank who would for a short time have the "great and glorious feeling" that he had "put one over."

San Francisco, Calif. G. L. HOLMES.

Diatomite and Diatomaceous Earth

THE EDITOR:

Sir—My interest in mineral terminology led me to note carefully your editorial on "Diatomite and Diatomaceous Earth" which appeared in the April 17 number of the *Engineering and Mining Journal-Press*. It is unfortunate, since you feel so strongly on the subject, that the editorial did not come out in the same issue in which you abstracted the article in question—namely, that of Dec. 26, 1925. It would then have been more effective in combating the use of the name which you deride.

It is again unfortunate that you continued to use the term "diatomaceous earth" instead of "diatomite" in the market reports of the non-metallics in your journal until Feb. 6, 1926. This use refutes the statement in your editorial; "It is true that the term 'diatomaceous earth' has been used to a considerable extent, but this was in the period before the material became of importance," implying that the term "diatomaceous earth" has not been used for some time.

There is no doubt that "diatomite" has certain things in its favor, but a name becomes adopted through use and, contrary to the implication of the editorial, the name "diatomaceous earth" has been used recently and is still being used in authoritative works in preference to "diatomite." To cite a few examples: "Marketing of Metals and Minerals," by Spurr and Wormser, section on diatomaceous earth, p. 290-296, 1925; "Non-Metallic Minerals," by Ladoo, p. 190-197, 1925; "Mineral Deposits," by Lindgren, p. 251, 1919; "Rocks and Rock Minerals," by Pirsson, p. 298, 1915; numerous articles, as for example, "The Manufacture of an Insulating Brick from Diatomaceous Earth," in the *Journal of the American Ceramic Society*, Vol. 7, p. 52, 1924; "Diatomaceous Earth," by Morris Goodwin, *Journal Industrial and Engineering Chemistry*, Vol. 15, p. 97, 1923. ERNEST E. FAIRBANKS.

Reno, Nev.

Consultation

Use of Manganese Ore

"We wish you would give us what information you have on the following questions regarding the uses of manganese ore:

1. What is the lowest-grade ore that will make ferromanganese?
2. In the manufacture of what articles is ferromanganese used, and what is the manganese content of such articles?
3. What is the lowest-grade ore that will make spiegeleisen?
4. Same as (2) about spiegeleisen.
5. What is the lowest grade of ore that will make manganese pig?
6. Same as (2) about manganese pig."

These questions are too general to be answered specifically. For instance, spiegeleisen serves as a deoxidizer in making steel, and the quantity of manganese left in the finished product depends on the way the steel is made. Likewise, the proportion of manganese to iron in an ore is more important than the manganese content in determining the suitability for making the various alloys. The correspondent should consult an expert, giving him full information regarding the ores he can produce. The following general information is taken from various sources.

Roughly, 95 per cent of the total manganese consumed is used in the manufacture of steel. On the average about 14 lb. of metallic manganese in the form of alloys is used per ton of steel.

In the manufacture of steel, the principal rôle of manganese is to rid the "bath" of oxygen and sulphur as far as possible, and to render less harmful what it cannot eliminate. In the present state of the art, it is indispensable for making sound ingots and good steel. Various substitutes have been tried, but so far nothing has been found as satisfactory or as cheap as manganese, and there is no indication today that it will be substantially replaced.

In addition to the functions just described, small proportions of manganese are retained in the steel to impart certain helpful physical qualities.

It is used in three principal forms, each being an alloy of manganese and iron, as follows:

a. *Ferromanganese,* the commercial "ferro" of the steel maker. The standard content of manganese ranges from 78 per cent to 82 per cent, but during the World War this was lowered to 70 per cent to permit the use of the leaner domestic ores.

b. *Spiegeleisen,* commonly called spiegel. This alloy has a wide range in manganese content—namely from 15 per cent to 35 per cent. Standard is 18 to 22 per cent, which, however, was lowered to 16 per cent during the World War.

c. *Manganiferous Pig Iron.* This is simply a special pig iron, containing 4 per cent to 10 per cent manganese.

Two other forms have been used to a very minor extent, namely, *silico-manganese* and *silico-spiegel.* In these forms the manganese is alloyed with both iron and silicon.

The availability of an ore of manganese for the manufacture of any one of the above alloys is governed largely by the ratio of manganese to iron in the ore, and can be readily calculated by those experienced in the business. Phosphorus content must also be considered. Ores from which ferromanganese can be made are called ferro-grade ores. They usually contain 35 per cent manganese and less than 5 per cent iron and 15 per cent silica. Ores suitable only for the manufacture of spiegeleisen are known as spiegel-grade ores. They contain 10 to 35 per cent manganese, 20 to 35 per cent iron and less than 20 per cent silica. Still leaner ores are used for making high-manganese pig.

The alloys are commonly made in the ordinary blast furnace, ore being mixed with coke and flux. Under certain rather limited conditions the electric furnace may advantageously be used, especially in the case of the silico-alloys. Manganese losses in smelting are heavy, ranging from 15 to 35 per cent. A fair average loss with ferro ores may be taken to be 25 per cent; with spiegel ores 30 per cent; and with manganese-pig ores, likewise 30 per cent.

Mexican Dollars

"Will you kindly explain to me how you arrive at the quotation on Mexican dollars published in the *Engineering and Mining Journal-Press?* The Mexican silver peso has been worth only about 48.7c. in American money for some time, here in Mexico, yet I see it quoted at 52c. or more. Why is this discrepancy?"

Our quotations on Mexican dollars are supplied to us by the firm of Handy & Harman here in New York, and represent quotations on the old Mexican pesos, which weighed, when new, 0.868 oz., of a fineness of 900. The actual silver content is therefore 0.7812 oz. A refining charge of 1c. an oz. is customarily deducted, the price being based on the price of silver for the day on which the quotation is made.

What you have in mind is no doubt the new Mexican peso, which weighs 0.536 oz., of a fineness of 720. The value of this in international trade is its exchange value rather than its bullion value.

Fouling of Cyanide Solutions

"Local regulations forbid the presence of cyanide solution in the streams near our mill. It may prove desirable to run a certain amount of cyanide to waste. What is a cheap and simple method of destroying the cyanide before discarding the solution?

"When solution is repeatedly circulated through a plant, with little or no wastage, and fouling is suspected, can this be confirmed by a simple test, without recourse to chemical analysis? Further, under these circumstances, what method would you recommend to insure that the working solution should always be kept in fresh and active condition? I noticed that difficulties arose at the Rosario mill through fouling of the solution in circuit, and recourse was had to a complete change of the brand of cyanide in use."

Since the experience and advice of several operators would be valuable, any hydrometallurgists who are interested are invited to make suggestions. These will be published without the name of the writer if he so directs.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

UNITED VERDE COPPER CO. shares employees' losses in Jerome bank failure; lets contract for Clark Memorial clubhouse and hospital; accident at mine kills two men.

Option on Giesche zinc mines exercised by Harriman and Anaconda companies; American operating company to be organized.

Calumet & Arizona company discovers additional deposits of rich copper ore—Greenback company sinking two shafts.

Maxville Gold developing mine and building mill—Royal Copper ships high-grade ore—Ariadne mine being developed.

Manzanall Camp, Sonora, Mexico, reported as active. Mining Stock Exchange considered in Mexico City; Oaxaca mines make regular shipments, and others adding equipment.

McIntyre to sink to 4,000 level—Pioneer Mines, Ltd., incorporated as subsidiary of Huronian Belt.

Silversmith pays $50,000 dividend in third quarter—Kafue dredge sinks—Premier Gold options seventeen Alaskan claims and may purchase Indian mine—Dunwell mines contract for 100-ton mill—Leaching plant at Grand Forks, B. C.

Gold reef discovered in Wanderer mine, and promising copper deposits revealed in Rhodesia.

Macassa Mines, Ltd., begins development at Kirkland Lake, Ontario.

Ontario Power Costs to Be Equalized

Survey of Province Being Made—Rates Vary From $25 to $90 Per Horsepower-Year

THE Northern Canada Power Co., which serves the mining fields of northern Ontario, states that, having acquired the Northern Ontario Light & Power Co., the company is now prepared to make a survey of the whole mining district, with a view to adjusting any inequalities. This, if done, will have a very favorable influence on the way in which the power company is regarded, particularly in the Kirkland Lake district. In this camp power costs are higher than anywhere else. The original contracts were written when the camp was small and when the total power consumption did not exceed 1,000 hp. Contracts provided for a stand-by charge plus a price on consumed horsepower. This, however, did not cover hoisting motors, which pay $25 per horsepower-year stand-by charge. The prices were based on a decreasing scale up to 500 hp., but no further decreases were provided beyond this point. At present some of the mines are using over 1,000 hp., and costs vary up to $90 a horsepower. A reduction of power costs in this camp would not only substantially benefit the operators, but would permit the treatment of lower grade ore.

It is understood that an adjustment has been made with the Night Hawk Peninsular mine, which was recently served with notice that its power from the Great Northern plant would be cut off on May 15. The power company now advises that the operations of this plant will be continued, and the change is understood to be due to the fact that since taking over the Northern Ontario Light & Power Co., which is a 60-cycle development, it has been decided to run a line from the Great Northern plant to Kirkland, as the Great Northern is also 60 cycle, as compared with 25 cycle for other plants.

Details of the Hollinger and Noranda power contracts are now available. The Hollinger guarantees the power company $650,000 a year for 15 years and secures power on the following terms:

For the first 5,000 hp. $50 per horsepower-year, for the next 5,000 hp. $30 per horsepower-year, for the next 5,000 hp. $20 per horsepower year, and $15 for any additional power required.

It is understood that the Noranda contract is the same, but that there is no yearly guarantee, as in the case of the Hollinger. On an operating basis of 4,000 tons a day, the Noranda power will cost approximately $26. This company will also have a further advantage in the fact that power will be generated from the waste heat of the smelting operations.

The power company states that other mines can get similar contracts to that of the Hollinger and Noranda if their requirements are sufficiently large.

The centralization of the management of power and light companies in northern Ontario, resulting from the recent transaction by which the Nesbitt Thomson interests acquire control of the holdings of the Northern Ontario Light & Power Co., will be beneficial to the mining districts. It is understood that it is the intention of the management to connect the various properties so that there may be an interchange of power between the different units in the event of a shortage of power in any district. This will necessitate the installation of a frequency changer, at an expense of about $100,000. Since the Nesbitt Thomson interests acquired the Northern Canada Power Co., the company has extended its line into Gowganda and is supplying power there, has rebuilt its substation, and consolidated its lines and switching at Timmins, expending over $300,000 on these extensions and improvements.

Calumet & Hecla Resumes Operations on Osceola Amygdaloid

The Calumet & Hecla company, Calumet, Mich., will resume operations at once in No. 13 shaft on the Osceola amygdaloid lode. Underground work will be extended as fast as the force can be built up. This will be the third Osceola lode shaft to resume within a year. Normal forces are now being employed in Nos. 14 and 15. These two shafts have steadily increased production and present output is estimated at better than 500,000 lb. of refined copper per month for each shaft.

A third stamp in the little Tamarack mill, on Torch Lake, will be put in readiness for use by Seneca Copper. Two heads now are in operation. Present output is around 1,200 tons daily.

The mines of the Copper Range company are on a considerably better production basis than the average monthly rate in 1925. Though there has been some talk of a falling off in values, Copper Range continues to be the richest amygdaloid group in the Michigan district and should hold this position for some years.

United Verde Will Share Employees' Losses in Bank Failures

When two of the larger banks in the Jerome district closed their doors quite unexpectedly a few months ago their action was looked upon as a catastrophe by many residents of the district, whose small savings vanished with the failure of the banking institutions. The United Verde Copper Co., however, is determined that those of its employees who were depositors in the two defunct institutions shall feel their losses as little as possible, and the company, therefore, though in no way connected with the two banks, has resolved to share its employees' losses, as the following letter from the general manager to such employees indicates:

"Mr. Charles W. Clark and Mr. W. A. Clark, Jr., president and vice-president respectively of the United Verde Copper Co., . . . extend to you and the members of your family who lost money in the failure of the Bank of Jerome and the Commercial Trust & Savings Bank their sincere sympathies and their checks for one-half of your losses. This applies to those who were in the employ of the United Verde Copper Co. and its subsidiaries at the time of the closing of the banks and who have remained in our service to this date. . . ."

Though there is no obligation on the part of the company to take the action indicated in the above letter, its action indicates a friendly and sincere interest in the welfare of its employees and a desire to make conditions in the district as thoroughly satisfactory as they can be made.

Shaft Sinking Progresses at Greenback Property

The Greenback Mining Co., operating 41 miles south of Casa Grande, Ariz., is sinking two shafts. The Pinal is already down 500 ft. and starting to crosscut on that level, and the Greenback shaft is down 150 ft. and is exploring the lode on this level. Both shafts have been in good ore for practically the entire distance. Recently chalcopyrite has come into the Pinal shaft, and the gold values have increased correspondingly.

The company has two compressors in operation, and is working about thirty men. A well-equipped camp and assay office has been built. At the present rate of development a substantial tonnage of commercial ore should be blocked out during the present year.

Royal Copper Claims Ship High-Grade Ore

G. M. Nyce, formerly active in copper mining operations in the Globe district, Arizona, has taken over control of the Royal Copper group of claims, near Dixon, Mont. He has shipped several carloads of ore assaying more than 11 per cent copper, with silver and gold content, and is considering the installation of gasoline-driven equipment, so as to increase shipments. Mr. Nyce and associates also are developing a promising lead-silver vein in the same district.

Earth-Shift Imperils United Verde Hospital

About eight years ago the present United Verde Copper Co. hospital was erected at a cost of approximately $150,000. It was located on the Jerome fault, about which not as much information was at hand then as now. Since then it has been learned that the earth movement due to this fault is from one to two inches a year. As a consequence, the building is gradually being torn apart. Mine timbers have been put in to steady the building, and every effort is being made to prolong its life until the new structure, already contracted for, is completed.

Work on the new Clark memorial clubhouse and the new United Verde Hospital, at Jerome, is expected to start soon. Contracts for both buildings have been let and plans and sites have been selected. They will be financed by funds left for that purpose in the will of the late Senator William A. Clark. The clubhouse will be for the use of the employees and officers of the company and their families, and is expected to form a center for the social life of the valley.

The new hospital will cost about $200,000.

United Verde hospital, Jerome, Ariz., which is being destroyed by earth movement

Maxville Gold Building Mill

According to George W. Quigley, general manager of the Maxville Gold & Silver Mining & Development Co., Maxville, Granite County, Mont., the raise started from the orebody on the main haulage level is now 100 ft. high and within 30 ft. of the upper workings. The raise is being driven on an orebody 15 ft. wide, from which a grab sample, taken from 41 mine cars, gave assays of 13.5 oz. of silver, $4 gold, 1.5 per cent lead, and 3 per cent zinc. The 12-lb. rails in the main tunnel have been replaced with 16-lb. rails over which the four-car trains are being hauled by mules.

Under the superintendence of I. O. Proctor, metallurgist, the mill building has been started, a 200-ton ore bin has been nearly completed, and an office and a warehouse have been erected. Until the mill is completed, shipments of the high-grade ore will go forward to the local smelters.

Calumet & Arizona Finds New Body of High-Grade Copper Ore

The Calumet & Arizona Mining Co., Warren, Ariz., continues to find new bodies of high-grade ore. Most of these deposits are quite extensive, and the grade is far above the average. The new orebody in the Junction property, in the Campbell shaft territory, continues to increase in size. The grade of the ore found in the different crosscuts in this part of the mine averages from 7 to 12 per cent copper.

Native copper and copper oxide have been found on the 2,200 level of the Junction, this being the lowest point where mining operations are under way. A small stringer of native copper and oxide was at first exposed, but this has widened out to almost a full face of high-grade ore. On one day alone 44 mine cars averaging 28.6 per cent copper are reported to have been sent to the surface.

Two new raises have been started on the 1,800 level of the Junction, and one of them has gone up six feet in 12 per cent ore. A crosscut in the Cole mine on the 1,100 level is also showing ore of a good grade.

Iowa-Tiger Group Resumes

Major G. R. De Beque, general manager of the Colorado-Mexico Mining Co., returned to Silverton, Colo., at the end of April and assumed charge of development of the Iowa-Tiger group of mines. All necessary supplies have been packed in over the snow and preliminary operations have been started by the superintendent, James Gordon Kyner. Work will be concentrated on examination and development of orebodies at and below the fourth level; and results of this development will determine ultimate purchase of the properties and enlargement of the mill.

Crawford Mill, at Ironton, Colo. Remodeled

The Crawford mill, at Ironton, Ouray County, Colo., has been bought from Hendrie & Bolthoff by J. H. Graham, J. W. Martin, W. A. Lewis, and C. B. Gauthier. It is planned to remodel the mill at once to handle complex lead-zinc custom ores by selective flotation.

Renewed Interest in Stevens County, Wash.

Area Dormant From 1895 to 1914—Good Ore Shipped in Early Days—More Development Needed

By R. G. McPhee
Spokane, Wash.

THE Stevens County district of the State of Washington is about 100 miles north from Spokane, and is served by a first-class highway. Mining locations were first made in the 80's, and shipments from the Old Dominion, Uncle Sam, Bonanza, and Deer Trail from 1885 to 1895 created quite a stir. It is estimated that during this period the four properties mentioned produced close to $3,000,000 in silver-lead ores. When the price of silver slumped in the 90's, and lead was also low, work was abandoned until 1914.

In the war years from 1914 to 1919 Stevens County was quite active. Copper properties were opened up and paid dividends to their stockholders. The Loon Lake copper mine disbursed $43,352 and the United Copper mines, at Chewelah, paid $150,000. The mines were closed down after the war and remained idle until about a year ago, when a new company was formed to take over the United Copper and Copper King, near Chewelah.

North from the Chewelah about 50 miles the Electric Point mine was operated during the war, and in less than two years paid $444,185 in dividends from a series of chimneys of lead carbonate. The company became involved in a controversy with the government over taxes and was shut down until a few months ago, when an agreement was reached.

Since the war Spokane men took over the Gladstone mine, adjoining the Electric Point, and, after about two years spent in development, began shipments of lead carbonate. The company is paying monthly dividends of one-half a cent per share. It is now the only regular dividend-paying mining company operating in Washington.

About 22 miles south from Gladstone the Old Dominion has been operating for more than four years. According to reports the shaft has been extended to about the 900 level and several pockets of rich silver-lead ore have been opened up and extracted.

Clugstone District Active in Development Program

About 12 miles north from the Old Dominion and about 12 miles south of the Gladstone is the Clugstone Creek district, with such properties as the Chloride-Queen, Neglected, New Leadville, and Uncle Sam mines, more or less engaged in development and taking out ore. The Chloride-Queen has expended almost $200,000 in underground development and has opened up a fair grade of zinc-silver-lead ore at a depth of about 900 ft. The company also expended close to $30,000 in building a mill to handle the ore, but either because of faulty design or insufficient testing of the ores, the mill does not make a statisfactory saving. It is reported that the company has secured additional finances and will soon reopen and ship ore to the custom mill operated by the Snowstorm at Troy, Mont.

The Neglected mine is about two miles north of the Chloride-Queen on the Onion Creek road between Colville and Northport. At this mine a shaft was sunk on an outcrop of lead carbonate and about 60 tons of ore has been taken from an upper tunnel. The Neglected company last summer expended about $10,000 in mine buildings and has a modern camp to take care of about twenty men. It will be necessary to drive a crosscut of from 1,200 to 1,500 ft. to get under the surface outcrop, giving a depth of about 700 ft.

New Leadville Refinanced

Adjoining the Neglected are the claims of the New Leadville company. This company also has a good surface showing and in the past operators made some money by extracting ore from shallow cuts and shafts. The present company was organized more than a year ago, and last summer started a development campaign. The company installed a compressor and drove a crosscut to get under the surface showing and against the contact of the limestone with an intrusive granite dike. After driving ahead about 400 ft. and cutting one vein carrying about $22 in silver and lead, the company ran into financial difficulties, and last winter the mine was closed. It is reported that efforts to refinance have met with success, that the property will soon reopen, and that the tunnel will be extended 700 ft. to the contact.

Adjoining the New Leadville is the Uncle Sam group. This is an old location and produced about $100,000 more than thirty years ago. Last summer a company was organized and placed a crew of miners at work. Driving ahead in the old crosscut ore was encountered. Two carloads of this ore have been shipped to the Bunker Hill smelter, and according to report returned 40 per cent lead, 15 per cent zinc, and a trace in silver. At about 190 ft. below the upper tunnel another tunnel has been driven in approximately 150 ft. The lower tunnel will also encounter the contact of the limestone with the dike at a point about 500 ft. ahead and then be under the real surface outcrop. This company is also attempting to refinance and install machinery, and, according to reports, will resume development work.

The location, surface outcrop, and general conditions at the Neglected, New Leadville, and Uncle Sam mines are more favorable than any other properties in Stevens County. Development at depth can be made by driving in tunnels, and the cost of the development will be less than at the Old Dominion, Gladstone, or Electric Point. The New Leadville crosscut gives hope that the carbonate ores will be replaced at depth by sulphide orebodies. Until some property gets a tunnel in to the contact Stevens County should not be condemned.

Tonopah, Nevada, Company Purchases McNeil Mine

The McNeil mine and adjoining properties, 71 miles west of Phoenix, Ariz., have been purchased by the Tonopah Belmont Development Co. from Charles K. Barnes and associates and some operation of the mine has been started. The operators declare that $750,000 worth of lead and silver ore is in sight and that the location is one of the best ever developed west of Phoenix. A $25,000 engine has been purchased, to be installed as the first unit of the power plant, and also machinery for a modern ice plant and refrigeration system. Excavation on the site of a 50-ton mill to handle the ore will be started within the next two weeks.

Noscut Mining Co. Files Articles of Incorporation

Articles of incorporation have been filed by the Noscut Mining Co. of Bisbee, Ariz., operating a silver-lead property 7 miles south of Vail, a station on the E. P. & S. W. railroad about 20 miles from Tucson. The company is incorporated for $300,000, divided into shares of $1 each. The property consists of ten silver-lead claims in a region that is noted for its rich bodies of high-grade ore. The company was formed two years ago and has drifted 400 ft. in its development. It is believed that work has progressed sufficiently so that the company can start regular shipments.

Bachelor Consolidated Progressing Favorably

New buildings are completed at the mine of the Bachelor Consolidated, in the Uncompahgre district a short distance north of Ouray, Colo., where a strike of rich silver-lead ore was reported last month. Headings on the 125 level show three feet of ore in one face and eighteen inches in the other.

Nova Scotia Oil Shales to Be Developed

Oil & Nitrate Products, Ltd., a Nova Scotia corporation, capitalized at $3,000,000, has undertaken the development on a large scale of the Pictou County, N. S., torbanites and oil shales. The property consists of a block of twelve square miles, situated adjacent to the town of New Glasgow, N. S., 100 miles by rail from Halifax. The field is held under 80-year lease from the Nova Scotia Government for oil, whether found in its natural state or in any other form, and associated minerals.

Torbanite, which is similar to coal in appearance, is not an oil shale, being far superior as to quality, richness, and amenability to extraction, the oils containing no sulphur and being superior to Pennsylvania crude oil. The company is carrying on experiments on various types of retorts to ascertain the type most suitable for the material in the Pictou field. Harold C. E. Spence, of Montreal and New York, is president of the company. He is connected with a number of other companies of a similar character.

U. S. Smelting Options Workman Group Near Battle Mountain

The U. S. Smelting, Refining & Mining Co. has taken an option on the Workman group of claims, 15 miles south from Battle Mountain, Nevada, and has started development work. The price asked is $100,000, payable $25,000 at end of 1926, $25,000 in June, 1927, and the remaining $50,000 at end of 1927. Discovery of the Workman was made in the fall of 1925, and the property includes fourteen claims. Values are principally in gold and surface showing is said to be very good. In addition to company work one set of leasers is driving a tunnel to tap a vein which shows good ore on surface.

Harriman and Anaconda Exercise Giesche Option

W. W. Harriman & Co., Inc., and the Anaconda Copper Mining Co. have exercised an option obtained last fall from the Bergwerks Gesellschaft, Georg von Giesche Erben of Breslau, Germany, for the acquisition of certain German and Polish interests of that company, including zinc, lead mines, extensive concentrating plants, smelting works, melting furnaces, and rolling mills.

The properties to be acquired will be transferred to an American company, to be organized, and it is expected transfer will be effected within the next three months.

Refinancing of North Star Mine

Rumors indicate new financing of the North Star mine, near Silverton, Colo. This mine was located in 1876 and in its day was the greatest producer of San Juan County. The mine was worked out practically to tunnel level in 1897, after which some shaft work was done from 1900 to 1905. Ore occurs in a fissure vein in monzonite, the average width being about 8 ft., and carries 0.5 oz. gold and 40 oz. silver per ton, with 50 per cent lead.

In recent years, until about 1922, the mine was worked under lease by John H. Slattery and associates. The title is held by North Star Mining & Milling Co., controlled principally by John H. Slattery, the estate of Matt Dalsant, King C. Gillette, and an associate.

Ariadne Mine Under Development; Title to Prospector Claim Decided

Under the direction of Henry Isotalo, discoverer of the Forest Rose mine of the Butte & Western Mining Co., a group of Deer Lodge investors is actively developing the Ariadne mine, situated between the old Gregory and Minnesota properties, about three miles from Wickes, Jefferson County, Mont. The Ariadne is being developed from the lowest tunnel level, the ore carrying values of lead, zinc, gold and silver.

John McBarron, manager of the Midwest-Butte Development Co., and associates are considering the development of the upper levels of the Baltimore mine, situated north of Boulder, Jefferson County, Mont. Leasers have been shipping lead-zinc ore from the intermediate levels. A low-voltage line of the Montana Power Co. runs to the property.

At a recent meeting at Duluth, stockholders of the North Butte Mining Co. approved the merger with the Tuolumne Copper Co., and F. R. Kennedy, of New York; W. P. Jahn, of Milwaukee, and John W. Neukom, of Duluth, were elected additional directors. It is believed that operations at the properties in Butte will soon be resumed.

In the suit of Fitschen Bros. and B. D. Phillips vs. the Noyes estate, the Supreme Court of Montana affirmed the decision of the lower court and found for the plaintiffs in the matter of title for a portion of the Prospector claim, which overlaps the Minnie Jane property, these claims being situated west of the School of Mines in Butte.

View of United Verde open pit, Jerome, Ariz.

Hassayampa Lets Contract for Mill Building

A contract was signed on April 20 for a steel mill building for the Hassayampa Placer Gold Mining Co.'s Independence mine. A. C. Haigler, Phoenix, Ariz., is general manager. The building will be 35 x 65 ft. with engine room 12 x 20 ft. A compressor building, 15 x 35 ft. is included. The mill building will house a Marcy rod mill, tables, and a flotation machine. In the Independence lower tunnel, a crosscut is being driven to cut the vein. The property is about 14 miles northeast of Hot Springs Junction, Ariz.

Ceylon Increases Graphite Exports in 1925

Ceylon exported 308,523 hundredweight (112 lb.) of graphite in 1925, an increase of 115,506 hundredweight over exports for 1924 and the largest amount exported since 1917, when 533,940 hundredweight were shipped, 1916 exports being 668,214 hundredweight. Since the discovery of the easily worked surface graphite in Madagascar the industry in Ceylon has not recovered its former prosperity, although recent years have shown a tendency toward increase. The United States, Germany, and the United Kingdom took increased supplies of graphite from Ceylon in 1925, and the price was satisfactory compared with recent years, although not equal to that once received. Of the total 1925 exports, according to the U. S. Department of Commerce, the United States took 38 per cent.

Blast at United Verde Kills Two Miners

Two men were burned to death, another worker is reported to be dying, and a fourth was seriously injured when blasting in the "fire stope" region of the United Verde Copper Co.'s mine at Jerome, Ariz., sent currents of air filled with red-hot dust particles and sulphur smoke into two levels of the mine.

A section of the United Verde mine workings has been burning for two decades, and after all manner of methods for quenching the fire had apparently failed, the fire was blocked off with bulkheads. As the result of the program designed to work the "fire stope" areas, the company has been steam-shoveling from the surface for a number of years.

A deep churn-drill hole from above into the fire area was blasted to open a surface connection with a "raise" from the lower mining levels. The blast shook the ground so that quantities of the red-hot material from the fire area fell into the upper part of the raise and sent currents of smoke-charged air into the working levels.

The four victims were attempting to get out of the levels, and had two possible exists before them, one safe and the other unsafe. According to the mine officials, they chose the wrong one.

Silversmith Pays $50,000 Dividend in Third Quarter

Silversmith Mines, operating in Sandon, B. C., has disbursed a dividend of $50,000, covering operations during the third quarter, ended Feb. 28, of its fiscal year, bringing the total disbursement up to $625,000 since the end of 1921, an exceedingly creditable performance on the small outstanding capitalization of $375,000. The silver content of the ore continues to improve with depth.

Ore milled during the last quarter was drawn from between the 800- and 1,000 levels, and it yielded the highest silver return per ton that has been received from any shipment. Owing to shortage of water during part of the quarter only 8,094 tons was milled. The concentrates brought payment by the smelter for 186,882 oz. of silver, 1,022,440 lb. of lead, and 533,596 lb. of zinc. The new winze on the Silversmith ore shoot was been sunk to the 1,200 level, where a station has been cut and drifting started. The sinking of the winze is being continued.

Leaching Plant for Seattle Mine, Grand Forks, B. C.

A California syndicate, operating a copper-ore leaching plant at Kennett, Calif., has taken a lease and option on the Seattle group of claims, at Grand Forks, B. C., and will erect a 60-ton leaching plant at a cost of $50,000. A test of the Seattle ore has been made in the Kennett plant, with satisfactory results. A large body of low-grade copper ore, carrying small values in gold and silver, was exposed some years ago on the Seattle group, but the mine has been idle since. The option is for more than $100,000, and a substantial cash payment has been made.

Asbestos Found in Revelstoke District, B. C.

The British Columbia Chamber of Mines has received samples of asbestos from Mount Sproat, in the Revelstoke district of the Province. F. M. Bancroft, of the Canadian Geological Survey, in a report on the occurrence, states that the belt of serpentine is about 1,000 ft. wide and is continuous for some distance along its strike. The mineral is of the chrysotile variety, and some good examples of both cross and slip fiber varieties can be found. The deposit is only one and a half miles from the railway, at Sidmouth.

Macassa Mines Begin Development —Wright-Hargreaves Enters Rich Ore

Macassa Mines, Ltd., of Kirkland Lake, Ontario, recently incorporated with a capital of $3,500,000, and which has taken over the Elliot property in addition to the original Macassa claim, has started operations. This gives to the Macassa company a total length of approximately 4,200 ft. along the strike of the main zone of mineralization of the Kirkland Lake field. The old Elliot shaft is already down 525 ft. A mining plant is being installed, and the program for development on an extensive scale includes crosscutting north from the present shaft, as well as carrying on diamond-drilling operations at a point further west. Harry Oakes is president and Robert A. Bryce managing director.

The Wright-Hargreaves mine, Kirkland Lake, Ontario, has encountered some rich ore in drifting on the No. 1 or north vein. Development work is being carried on at the 1,250 level, where the orebody is wider.

Premier Gold Options Claims on Alaskan Soil, and Is Negotiating for Indian Mine

The Premier Gold Mining Co. has bonded the Cantu and Frances groups, aggregating seventeen claims, situated at the foot of the Salmon glacier, on the Alaskan side of the international boundary. The claims were staked late in last summer, and twenty tons, broken from the outcrop without the use of powder, was shipped to the Selby smelter and gave a return of around $100 per ton in silver, lead, and gold, the chief values being in the two first-named metals. The ore zone has been opened, here and there, over a length of 1,000 ft., but, as yet, sufficient work has not been done to determine its width. The consideration that the Premier company is said to be giving is $80,000 for a four-fifths interest, which includes a cash payment of $5,000.

There is a persistent rumor in the towns of Hyder and Stewart to the effect that the Premier company is negotiating for the purchase of the Indian mine, situated 1¼ miles to the north-northwest of the Premier mine. Indian Mines Corporation, and previous companies which it has absorbed, has spent some $350,000 in the development and equipment of the mine. An ore zone has been opened on four levels. The Premier company's engineers have examined and sampled the mine, and the ore, which is complex, is undergoing laboratory tests.

Black Bear Mine Resumes

A snowslide recently destroyed all the mine buildings of the Black Bear group, in San Miguel County, Colo., and killed two men. Isak Partenen, leaser, is putting the property in condition again to resume mining. The ore is complex, carrying lead, copper, silver, zinc and gold. The quartz vein is about 10 ft. wide, and is supposed to be continuation of Argentine vein of the Tomboy property. Last year the Partenen lease made regular monthly shipments to Durango to be treated by th Coolbaugh process.

Consolidated Mining & Smelting Ships High-Grade Lead Ore

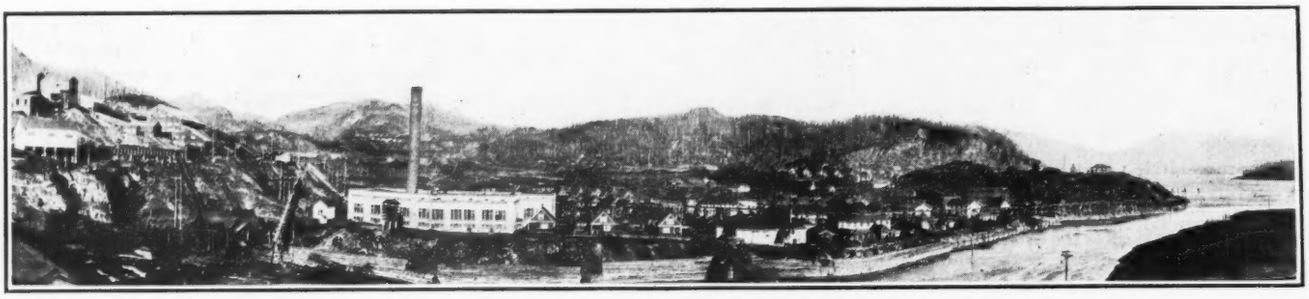
The Consolidated Mining & Smelting Co. of Canada has driven into a lens of galena ore in the Sullivan ore deposit, at Kimberley, B. C., and has taken from it and shipped to Trail eleven cars of ore assaying 15 to 20 oz. of silver and about 50 per cent of lead.

Dunwell Mines Lets Contract for 100-Ton Mill

Dunwell Mines, which for the last four years has been developing a mine on Glacier Creek, in the Portland Canal mining division of British Columbia, has let a contract to Burch, Hershey & White, of San Francisco, for the erection of a 100-ton mill and a 4,200-ft. aërial tramway from the mouth of No. 4 tunnel to the mill. Lloyd C. White, who will superintend the construction, will leave for the property within the next few days. Until the work is completed the Dunwell will continue to ship selected ore to the Trail smelter.

Kafue Dredge Sinks

The buckets of the Kafue Copper Development Co.'s dredge, which has been working so successfully on Antler Creek, in the Cariboo district of British Columbia, came in contact with a sunken timber recently, which caused the dredge to sink. The Pacific Salvage Co., of Vancouver, has undertaken the work of refloating the dredge, and has dispatched a gang of men, including a diver, to Barkerville, but the roads between Quesnel and Barkerville are in bad condition, owing to the spring thaw, so it may be some time before the necessary gear can be got to the scene of the accident. Part of the dredge is above water.



Panorama of Anyox, British Columbia

McIntyre to Sink to 4,000 Level —Crow Purchases Crœsus Mine

The 3,000 level of the new No. 11 shaft of the McIntyre mine, of Schumacher, in the Porcupine district, Ontario, will be reached soon. The company is considering the advisability of immediately continuing it to 4,000 ft., as with the trained crew and all the necessary equipment on hand, the work will probably be done cheaper now than later. Announcement is made of the regular quarterly dividend of 5 per cent, payable May 20.

It is reported that H. C. Crow, president of the Barry-Hollinger company, has purchased the famous Crœsus mine, near Matheson, which several years ago produced the most spectacular gold ore ever found in Ontario, one specimen being valued at more than $10,000.

The Gowganda property of the Porcupine Keora company has been closed down pending reorganization. Formation of a new company, with a capitalization of 2,500,000 shares, is under consideration.

Mohawk Has Best Ore in Its History

AT THE Mohawk property, at Mohawk, Mich., the richest ground in the history of the mine is being opened in No. 6 shaft, yielding between 27 and 28 lb. of refined copper per ton. The vein is showing higher values in mass copper and silver. The shaft is 2,430 ft. deep. Ground fully as rich is occasionally opened in No. 4 shaft, which is working from the 20th level upward, extending stopes and moving backs. No. 1 shaft rock is lean, but is proving profitable through close selection. No. 1 supplies only 20 per cent of Mohawk rock and No. 6 approximatley 50 per cent.

Michigan Iron Ore Shipped to Alaska

The Cleveland-Cliffs Iron Co. has forwarded 50 tons of iron ore from its Republic mine, Republic, Mich., to the Sitka Gold Mining Co., Sitka, Alaska. The ore was placed in sacks holding 200 lb. each and sent by rail to Seattle, where it was transferred to steamer. Freight from Republic to Seattle was 75c. per 100 lb. The ore, high in iron and containing only about one-half of 1 per cent in moisture, will be used in experimental work. A number of the copper smelters receive regular shipments of this grade of iron ore from the Cleveland-Cliffs company, most of it being supplied by the Cliffs mine at Ishpeming, Mich. The Calumet & Hecla company receives two cars each week at its smelter at Dollar Bay. The Cliffs property has more customers than any other iron mine of the country, and is a large producer of hard ores.

Slate Range Property Reported Sold

The Nevada Hills Mining Co., which owns mining property in the Fairview district, in Nevada, and which acquired and is operating oil properties in the Kern River and Midway districts of California, is reported to have purchased the holdings of the Slate Range Consolidated Mining Co., 8 miles northeast of Trona in the Slate Range Mountains. Plans are under consideration for the rehabilitation of the property, which has produced lead and silver.

Montana Mine Dumps and Tailings to Be Milled

W. R. Price, mining engineer, of Helena, and the Irwin syndicate, of Chicago, have taken over the Brennan mill, on the Curlew property, at Victor, Mont., and will treat a large tonnage of mine dumps and probably extract ore from the property, on which they have an option. The flow sheet of the mill will be revised so as to include table concentration and flotation and the operators will develop their own hydro-electric power. This mine, owned and formerly operated by the A. M. Holter estate, of Helena, has produced a large amount of high-grade lead-zinc-silver ore.

The lease on 580,000 tons of Granite-Bimetallic mill tailings, Philipsburg, Mont., has been awarded to C. L. Hewitt and associates. They are now conducting tests, and expect soon to start construction of two milling plants, one to be erected at the upper tailings deposit and one at the lower.

Tonopah Belmont Developing Mine and Installing Small Mill

The Tonopah Belmont Development Co. has started construction on a 25-ton pilot milling plant at its Hamilton, Nev., lead-silver property. This property is about four miles west of Treasure Hill, one of the early-day bonanzas.

The mine is developed by tunnel to a depth of 275 ft., and by winze an additional 285 ft., with levels established at 150 and 245 ft. The ore is variable in width, from a mere seam up to 20 ft., mostly carbonate in character, and it is believed will concentrate without crushing if the coarse material is first removed by screening.

Alaska Juneau Mines 301,900 Tons in April

Alaska Juneau in April, 1926, reported 301,900 tons mined and trammed to mill, from which a production of $139,200, or 46.11c. per ton, was made. Operating expenditures totaled $143,400, or 47.50c. per ton, leaving an operating loss of $4,200 for the month. Other expenditures and accrued charges totaled $29,600, leaving a deficit of $33,800 for the month. Addition to milling plant is 72 per cent completed.

Reduced Freight Rates May Save Arizona Copper Industry $300,000 per Year

A saving of $300,000 a year to the copper industry of Arizona is possible if the plan for shipping copper to Eastern points by way of Los Angeles and the Panama Canal proves feasible. The United Verde Copper Co. has signed a contract with the American Hawaiian Steamship Co. to ship 500 tons of copper a month for six months by this route. This agreement was entered into by the mining company so as to ascertain the cost of shipping the metal by the new route. Charles H. Spear, general manager of the Los Angeles harbor, and Fred A. Hooper, general agent of the steamship company, state that the cost of shipping will be reduced by $1 per ton. The charges at Los Angeles harbor for wharfage, handling, and stevedoring have been reduced approximately 50 per cent, all interests concerned agreeing to the reduction in order to secure the copper tonnage. The ocean shipping charge has also been reduced.

The Los Angeles Chamber of Commerce is attempting to have the rail tariff from Arizona points to Los Angeles lowered. This rate at present is $6 a ton, whereas the rate from Arizona to the Atlantic Coast is $12.50. Mr. Hooper and Mr. Spear plan to make a trip through Arizona in the near future for the purpose of developing more shipping for Los Angeles.

Johannesburg Letter

By John Watson

Special Correspondent

Transvaal Chamber of Mines an Important Factor in Mining Industry

Johannesburg, April 6—The retiring president of the Transvaal Chamber of Mines, P. M. Anderson, made a notable speech at the annual meeting held on March 29, showing how dependent the future of the mining industry is upon a sympathetic attitude on the part of the government. Mr. Anderson emphatically repudiated the impression that the Chamber has any political partisanship. In the last year, not fewer than 82 companies and syndicates came into being for mineral exploration and 50 of this number were in connection with platinum ventures. Though some of these companies will fall by the wayside, there is good ground for believing that the platinum production of the Transvaal will ultimately assume very substantial proportions. The problem appears to be a question of marketing rather than of production.

Mr. Anderson expressed the hope that the government in its future dealings with the industry might be more disposed to consider the economic rather than the political aspect of matters affecting the industry. The Chamber, as such, has no political affiliations, and its desire is to work amicably with the government in power, whatever its political complexion, unless compelled by hostile legislation to take an attitude of opposition.

Sperrylite an Important Mineral

Crystals of the rare mineral, sperrylite, of a size hitherto unheard of in other parts of the world, were exhibited at the Geological Society's meeting in Johannesburg, and described by Dr. P. A. Wagner, on March 29. Sperrylite is the arsenide of platinum and is the only natural compound of this precious metal. These crystals were kindly lent by the Johannesburg Consolidated Investment Co., Ltd., and were taken from the platinum deposit on the farm Tweefontein, No. 1033, 15 miles N.N.W. of Potgeitersrust, where the sperrylite occurs in crystals ranging from 0.05 in. to 0.675 in. across, the largest crystal so far found weighing 1.5 oz. They are imbedded in copper-stained iron oxides. The sperrylite crystals are of a bright tin-white color, with splendent luster. Many of them look as though they had been polished, and they are objects of great beauty. This rare mineral was first identified in South Africa in 1923 by C. C. Cardthausen, in a specimen of gossan, collected by Dr. Wagner on Vlakfontein, in the Rustenburg district. Last year, it was found by Dr. E. Rewnig in the platinum ore of Sandsloot, No. 276, Potgietersrust district.

Rhodesian Mineral Industry Promising

At the annual meeting of the Rhodesian Chamber of Mines, on March 31, at Bulawayo, the president, G. McDonald, said that the position of base min-

erals in Southern Rhodesia is very encouraging. Chrome, asbestos, and coal all showed notable increases in production. Since modern mining started in Southern Rhodesia up to the end of 1925, that political subdivision's grand total of mineral production had a value of £79,272,686.

At the Lonely Mine, the deepest in Rhodesia, the vertical shaft is 4,100 ft. deep. At a depth of 3,000 ft. a new orebody has been encountered.

Manzanall Camp, Sonora, Mexico, Reported to Be Booming

The Manzanall district, 24 miles south of Cananea, Mexico, is becoming one of the most active mining camps in that section of Sonora, and one property in particular bids fair to become an exceptionally large producer of high-grade silver-lead ore. This property, formerly operated by Alfred Paul, of Douglas, is reported to have broken into a ledge of high-grade ore, and has started construction of a 50-ton concentrator. Two cars of ore per month are being shipped out, and the completion of the mill will increase this output considerably. The ore is reported to have been struck about twenty feet from where Alfred Paul and his associates stopped their drift and gave up the lease.

The new company, which is headed by Los Angeles mining men, will sink the shaft to the 500 level and drift to the ledge, which indicates that other orebodies may be expected. A number of houses for employees have been built, and a company store has been started.

Revival of Mexican Mining Stock Exchange Considered

There is apparently a strong movement among the financial interests in Mexico City to re-establish the Mining Stock Exchange, defunct for many years. It is believed that business generally will be benefited by establishing an open market for mining and other stocks. Absence of regular market quotations is believed to have caused large sums to be invested in foreign securities, much to the detriment of local developments. Albert J. Pani, Secretary of the Treasury, is to be asked to take this plan into consideration in formulating new financial laws.

Pioneer Mines, Ltd., Incorporated as Subsidiary of Huronian Belt

A new company, in which British capital is largely interested, has been incorporated under the name of The Pioneer Mines, Ltd., of Toronto, Ontario. The new company is being promoted by the Huronian Belt Mining Co. and associated interests, headed by F. H. Hamilton as chairman and with J. Mackintosh Bell as managing director. The company has an authorized capitalization of five million shares of the par value of one dollar each. Of these, 1,500,000 have been underwritten.

The holdings of the company include the Cooper Mine, the Minto Mine, and other claims in the Michipicoten district of northern Ontario, extensive lead and zinc properties in the Gaspe Peninsula of Quebec, and also claims in the Red Lake district and elsewhere.

London Letter

By W. A. Doman

Special Correspondent

Gold Reef Discovered in Wanderer Mine—Benguella Railway Secures Loan

London, April 27—Some time ago I mentioned that there was a possibility of the old Wanderer mine, in Rhodesia, being resuscitated. It was previously a low-grade property, and the company was wound up in 1920. The manager, however, had an idea that there were still undiscovered deposits, and he has proved his belief by uncovering a valuable gold-bearing reef. The mine, it is said, is likely to turn out to be one of the biggest in the country. Some idea of the value of the discovery may perhaps be gathered from a report that the vendor selling price to a new company is approximately £1,000,000.

Under the Trade Facilities Act of the British Government (to come to an end next year), a loan of £1,500,000 is guaranteed for the completion of the Benguella Railway from Lobito Bay to the Congo border. Some South African authorities are complaining that this is subsidizing a railway as against local interests, for its completion will open up the Belgian Congo and may check the construction of other proposed South African lines.

Naturally, the people of Rhodesia want their country opened to development as soon as possible, and some of them apparently are on the warpath in regard to the Rhodesian Railways. By reason of recent wash-outs on the Beira line, the delivery of mining machinery and supplies to various mines has been greatly delayed, and though the revenues of the country would be interfered with by the construction of the Messina line—a shorter route than Beira—there is still the possibility that this project may come about. Sir Charles Coghlan, the Premier, and one or two other Rhodesian representatives are on their way to London to discuss matters with the directors of the British South Africa Co., and to see what arrangement can be made.

Promising Copper Deposits in Rhodesia

The old Falcon Mines company, in Rhodesia, is now concentrating on the M'Tuga mine, in the Luusenfwa district of Northern Rhodesia, 30 miles from a station on the main railway line running from Broken Hill to the Belgian Congo. The area pegged consists of three consecutive base-metal blocks of 30 claims each, forming an area of about 186 acres in extent. The ore opened out over a length of 160 ft. is estimated at 20,000 tons, averaging 8 per cent copper. Exhaustive tests have shown that a high extraction could be obtained by mechanical concentration and oil flotation after crushing and grinding the ore to a medium degree of fineness.

From the copper standpoint it seems that Rhodesia may play a big part in the future. The N'Changa deposit of the Rhodesian Congo Border Concession is opening up well in various parts, the west drive for 80 ft. west of No. 3 shaft averaging 9.2 per cent copper.

At the annual meeting of the Consolidated Mines Selection, Walter McDermott spoke encouragingly of a new gold-mining venture, in which the directors are taking an active part—the Botanamo Mining Corporation. The property has an area of 4,200 acres in the district of Roscio, Venezuela, about 50 miles from the old El Callao. "The risk of losing any money," he said, "seems to me unusually small."

Oaxaca Mines Making Shipments and Adding Equipment

The La Esperanza, a prospect, has been sold by Thomas A. West to Milwaukee (Wis.) parties, and work of development will begin in May. This property is in the Taviche district, Oaxaca, Mexico, about two miles from the railroad, and carries values in gold and silver. The last ore sold from it contained about 8 kg. in silver and 70 to 80 gm. in gold, per ton.

The Garzona mine, on the railroad about 30 miles south of Oaxaca, has shipped a number of cars of gold-silver ore and has a considerable quantity stacked up awaiting shipment. The shipments already made have assayed about 13½ kg. in silver and 98 gm. in gold.

All machinery for the Oaxaca-Mexico Development Co.'s new mill, of which W. H. Dudley is manager, has been received and is now being freighted out to the millsite, about 32 miles from Oaxaca. The average cost of this delivery by pack animals is about $60 per ton. The company has purchased a Ford caterpillar tractor, the first in this section, and expects to handle the heavier freight at a cost of about $20 per ton, using two days in the round trip, whereas with bull teams hauling a load from 1,000 to 2,000 lb., necessitated, at least, eight days.

The American Smelting & Refining Co. is retimbering the working shaft of the San Juan mine, but progress is slow, because of the extensive caving encountered. This company has recently denounced a tract of 105 pertenencias at a point between Taviche and Tehuantepec, and officials have stated that early in May they will have a corps of examining engineers on the ground to make an examination.

The last shipment from the Totolapam district comprised eighteen tons of concentrates and several bars of bullion, the liquidation with the local ore buyer netting the company nearly $20,000. It is announced that a truck road, to cost about $100,000, will be built at the close of the coming rainy season, so that the freight rates from Totolapam, about 65 miles, may be appreciably lowered, freight now costing about $35 per ton.

Kirkland Lake Encounters Good Ore on 2,250 Level

Assays from the Kirkland Lake gold mine, Kirkland Lake, average $25 across the width of the drift recently opened on the 2,225 level. Drifting operations are being continued to the east in the general direction of the Teck-Hughes mine. Drifting is also being conducted on the 2,100 level.

Situation at the Mines

By Albert H. Fay
Assistant Editor

THOUGH a general decline in metal prices since January is to be noted, there does not seem to be a corresponding decline in field operations. Gold discoveries are occasionally reported, new mines are being opened, new mills and reduction works are aplenty; prospecting continues, and in many of the older districts renewed activities are in evidence.

Average Prices, September, 1925, to March, 1926

Period	In Cents Copper	Lead	Zinc	Silver
October, 1925	14.300	9.513	8.282	71.106
November	14.353	9.739	8.614	69.223
December	13.866	9.310	8.565	68.889
Average, 1925	14.042	9.020	7.622	69.065
January, 1926	13.822	9.255	8.304	67.795
February	13.999	9.154	7.759	66.773
March	13.859	8.386	7.332	65.880
April	13.706	7.971	7.001	64.409

Copper—The Elizabeth mine, South Strafford, Vt., has been leased for a period of 25 years to the American Metal Co., and ores from this property will be treated by flotation. New Cornelia, in Arizona, is exploring property with diamond drills. United Verde has taken a 90-day option on the Old Mammoth mine, at Schulze, Ariz. The Flin Flon Copper Co. is now engaged in development work in Manitoba, and has prospects of a railway connection at an early date. There has been considerable agitation with reference to the proposed duty of 6c. per lb. on copper, but apparently it will not be passed at this session of Congress. Miami copper is now milling 11,000 tons per day, and Calumet & Arizona is adding to reserves by discoveries of high-grade copper ore. The United Verde has let a contract to build a memorial club at Clarkdale and a hospital at Jerome, Ariz.

Butte is steadily producing copper at the rate of a little over 18,000,000 lb. per month. The Anaconda company is making ready for the new 2,150 hp. electric hoist to be placed at its Belmont mine.

Mines of the Michigan copper district are gradually increasing production. Calumet & Hecla Consolidated and Copper Range increased output considerably in April and the total for the district was approximately 14,500,000 lb. Labor is more plentiful than usual, and less difficulty is being experienced in building up underground forces. The first boat of the season took out 300,000 lb. of copper for eastern delivery.

Gold—The most important event in the month was the flotation of an issue of stock of the Panama Corporation based on gold concessions recently obtained in Panama. This flotation was oversubscribed. A discovery of gold at Kramer, Calif., has been reported, and many claims have been staked as a result of the rush to the field. Diamond drills have begun operation in the Red Lake, Ontario, area, where about 5,000 claims have been staked. Birch Lake area, east of Red Lake, is attracting many prospectors. In the Transvaal native labor has increased in numbers, but the gold production remains about the same. The Tom Reed Gold Mines Co., Oatman, Ariz., has acquired an interest in the Allison gold mine. Hassayampa Gold Placer Co. has ordered a dredge to be installed at its gravel properties in Arizona. The Katherine Gold Mines Co., Kingman, Ariz., is increasing capacity from 200 tons to 500 tons per day. Other mines in the same district are also active. In California, the Mother Lode district has five major and several smaller mines actually engaged in the production of gold, with about 1,500 men employed. In the Tonopah district, Nevada, production is about $175,000 per month.

There is some activity in the placer districts in Montana, as several large companies have been sampling deposits and installing hydraulic equipment. In the Philipsburg district of Montana the newest developments were the opening of the vein north of the fault in the properties of the Maxville Gold & Silver Mining & Development Co. and the preliminary work done looking toward the construction of two mills on the old tailings dumps of the Granite-Bimetallic Mining Co.

Lead-Zinc—There was no material change in the usual output of lead and zinc in the Cœur d'Alene district, Idaho, during the month of April. The decline in metal prices is viewed with some apprehension. Much new mining development is going on throughout the district, and the outlook is favorable for several new and regular producing mines by the end of the year. Notably, the Star mine is producing 4,000 tons of concentrates per month and will be producing up to its capacity of 450 tons per day by the first of June. By the first of July the Sidney mine will have completed the three and a half mile tramway, which will permit increased production. The Bunker Hill & Sullivan company is remodeling the Sweeny mill to handle lead-zinc ores of Pine Creek on a custom basis. The Bunker Hill smelter is operating two furnaces. Cœur d'Alene freight rates to Portland were increased $1 per ton effective May 1. Atlas tunnel, at Murray, was advanced 551 ft. in one month.

The Julian Leadfield promotion in Southern California has been under investigation by the California Corporation Commission as to its methods of exploitation. In Arizona the Big Jim Mines Co., Patagonia, has completed its flotation mill. The Consolidated Mining & Smelting Co. has had a prosperous month by reason of production of new rich ore from the Sullivan mine, in British Columbia.

Zinc—The principal event in the zinc industry was the restriction of production in the Joplin-Miami district by a number of the mines closing down part of their operations. The principal reason for this is to prevent overproduction. There is no let-up in prospecting and development work. The Eagle Picher plant at the Victor Mine No. 2 was damaged recently by fire, and the Big Chief Mill at Picher, Okla., was destroyed by fire. Deposits of zinc blende were discovered at Maniwaki, 100 miles north of Ottawa, Canada. The Polish Diet has granted a tax exemption to the zinc industry as a preliminary to the closing of the transaction with the Harriman-Anaconda interests, for the Giesche zinc mines, which contract has been consummated.

In the zinc-silver belt at Butte, two Eastern companies are making plans to start operations, and in the eastern part of the district, active work will soon be started by the enlarged North Butte Mining Company. There is good inquiry for machinery from some of the smaller mining districts, prospectors being more active than in some years.

Silver—No important developments have been reported in the silver industry except possibly the purchase option which was secured by the Peñoles Mining Co. on the property of the Presidio Mining Co., at Shafter, Tex. This mine has been in operation for about 30 years, but is now apparently passing into the hands of the Peñoles company.

Iron—Many of the iron ore mines of the Lake Superior region began shipping to the docks at the head of Lake Michigan during the last two weeks of the month, and the first boat was loaded at Escanaba before the period closed. The open-pit mines did not get under way, but the underground mines forwarded ore from pocket and some of them loaded from stockpiles. Two Michigan mines, the James, at Iron River, and the Austin, at Gwinn, resumed mining operations after several years of idleness. One property, the Eureka, at Wakefield, Mich., reduced its working force by 250. The mines have considerable ore in stock, but an active shipping season is anticipated. Navigation opened later than usual, but will be in full swing by May 15.

On the Mesabi range the cold weather continued and navigation did not open until May. Some mines shipped stockpile to reduce "ore in stock" May 1. All loading equipment and washing plants have been placed in first-class condition and are only waiting for the boats.

General—At Butte, the American Chrome Products Co. was organized recently to develop chrome properties in Stillwater County, Mont. The German-French pool was formed to control exports and allocate production of potassium salts and byproducts. Salt River Valley, Ariz., has been benefited by heavy rains, thus assuring ample hydroelectric power for mining companies situated in Superior, Globe and other districts. A diamond discovery in South Africa was reported on April 9, which was followed by a rush of 2,000 prospectors. Two disastrous oil fires occurred in California, resulting in damage amounting to about $13,000,000, to the Union Oil Co.

Men You Should Know About

Dr. Henry Mace Payne

Dr. Henry Mace Payne has been appointed consulting engineer and geologist to the Gulf, Mobile & Northern Railroad. Dr. Payne will continue his connection as consulting engineer to the American Mining Congress, but has closed his office at 300 Madison Ave., New York City.

Robert D. Ferron has opened an office as consulting engineer in La Paz, Bolivia.

Foster S. Naething, mining engineer, of Joplin, Mo., is at the Biltmore, in New York City, for two weeks.

Walter L. Reid, consulting mill and cyanide engineer, has opened an office at 1105 Story Building, Los Angeles, Calif.

Carl F. Schaber and **Paul Larsh** have recently completed examination of the Santiago mine, in Chihuahua, Mexico.

Frank Lurchin, mining engineer, has been examining the Stephenson-Bennett mine near Organ, N. M., for New York interests.

George W. Stose, of the Geologic Branch of the U. S. Geological Survey, was engaged in field work in Pennsylvania during April.

E. F. Bean, who has been Acting State Geologist of Wisconsin, has been appointed to that position to succeed **W. O. Hotchkiss,** resigned.

Frederick Laist, metallurgical manager of the Anaconda Copper Mining Co., is at the Giesches Erben Zinc Works, on the German-Poland border.

George R. DeBeque, mining engineer, of Denver, Colo., is at Silverton, Colo., superintending the unwatering of the Melville mine of the Iowa-Tiger group.

Hugh Jardine, who was for many years with the Teck-Hughes mine, has been appointed manager of the Kirk Gold Mines Co. of Kirkland Lake, northern Ontario.

Dr. G. S. Hume, of the Canadian Geological Survey, has recently published a report on "Oil Prospects in the Vicinity of Battle River at the Alberta-Saskatchewan Boundary."

T. Wayland Vaughan, of the Geologic Branch of the U. S. Geological Survey, has been in Washington for about two weeks attending the meetings of the National Academy of Sciences.

Philip R. Bradley, mining engineer of San Francisco, is on his way to Sudbury, Canada, where the Bradley interests are devloping a mining property. He will return via Kellogg, Idaho.

Franklin W. M. Cutcheon, of New York City, has been elected a member of the board of directors of New Cornelia Copper Co. to fill the vacancy caused by the death of the late General John C. Greenway.

Lorne A. Campbell, general manager for the West Kootenay Power Co., the Consolidated Mining & Smelting Co. of Canada's power subsidiary, has returned to Bonnington Falls from an extended trip to Australia.

H. A. Guess, vice-president of the American Smelting & Refining Co., was given, at a convocation held on May 5, by Queen's University, at Kingston, Canada, the honorary degree of doctor of laws for conspicuous achievements as a mining engineer. Mr. Guess is a graduate of Queen's University, class of '95.

A. McIntosh Reid

A. McIntosh Reid, Chief Government Geologist of Australia, has been appointed Director of Mines of Western Australia, pursuant to a new mining policy adopted by the Tasmanian Government. Mr. Reid, besides being a geologist, is a civil engineer, surveyor, mining engineer, and metallurgist, and has a wide knowledge of Tasmania.

Thomas D. Bayne, graduate of the Royal School of Mines, London, and for the last two years in the research department at the Washoe smelter of the Anaconda Copper Mining Co., recently left for a two months' visit to Helensburg, Scotland, after which he will join the metallurgical staff of the Union Minière du Haut-Katanga, in the Belgian Congo.

F. E. Evans, lately with the Underwriters Land Co., of Picher, Okla., and Louis d'Or Mining Co., of Miami, Ariz., is in charge of driving the new Montecito water tunnel through the Coast Range at Santa Barbara. The tunnel will be 2¼ miles long, and operations have now completed 4,900 ft., making 325 ft. a month. Much water has been encountered.

C. H. Benedict, chief metallurgist for Calumet & Hecla Consolidated, in the Michigan copper district, will deliver lectures to the classes in hydrometallurgy at the Michigan College of Mines, Houghton, for the remainder of the spring term. He also will give six lectures on the subject of ore dressing. Some of the lectures will be illustrated and will deal with both metallurgical and economic factors.

Gordon R. Campbell, president of the Calumet & Arizona Mining Co., in company with several of the board of directors, is visiting the company's properties in the southwest before proceeding to Bisbee, Ariz., for the company's annual meeting. The plants visited will include the 85 Mine, at Valedon, N. M., the smelter at Douglas, Ariz., the Verde Central mine, at Jerome, and the New Cornelia, at Ajo, Ariz.

Major-General Hughes, one of the principal officials of the Mount Elliott company, arrived from England at Cloncurry, Queensland, Australia, last March, for the purpose of initiating the plans of that company to resume operations on its copper properties in the Cloncurry field. He was accompanied by **H. S. Mackay,** the patentee of the Mackay chemical process for the treatment of copper ores, which process the Mount Elliott company has decided to install at central works to be erected at Cloncurry.

S. Power Warren, of the Colorado School of Mines, has just returned from a trip to the Kennecott Copper Co., at Kennecott, Alaska, where he was sent to study the ammonia leaching plant, for the Mazapil Copper Co. He reports that through the co-operation of the men in charge at Kennecott he was able to return with a comprehensive understanding of the operation of that plant. On his way back to Golden Mr. Warren visited flotation plants in and around Wallace, Butte, and Salt Lake, so that he would be able to return to Golden with the most recently developed facts concerning milling practice and trend. This information will be the subject of the last lectures of this term to be given the classes in ore dressing at the school.

S. Power Warren

Louis Ware, until recently assistant mine superintendent for the Miami Copper Co., has accepted the position of mine superintendent for the Anglo-Chilean Nitrate Corporation, which operates an open-pit mine in the nitrate district near Tocopilla, Chile. Before leaving for South America with his family Mr. Ware expects to make trips of inspection to the Utah Copper, Nevada Consolidated, and Chino properties. **R. W. Hughes,** chief mine engineer for Miami Copper, has been advanced to fill the vacancy created by Mr. Ware's resignation, and **E. V. Graybeal,** efficiency engineer, has been made chief mine engineer.

Obituary

Charles F. Farren, formerly secretary to Andrew W. Mellon, and who had large oil holdings in Oklahoma, died on May 1 at Tulsa, Okla. Mr. Farren was fifty-two years old.

Samuel Price Wetherill, formerly associated with the late John Price Wetherill and August Heckscher in the Lehigh Zinc & Iron Co., and who was largely responsible for the merger that created the New Jersey Zinc Co., died in Philadelphia on May 2. Mr. Wetherill was eighty years old.

William B. Ridenour, one of the last of the remaining pioneers who came to Mohave County, Ariz. in the early days, died at his home near Hackberry recently. Mr. Ridenour was ninety years old. He came to Arizona in the early 70's, and was the discoverer of the Hackberry mine, the Pure Metal copper mine, at the Grand Canyon, and the Independent mine, at Chloride.

Edward W. Harris, Western miner and prospector, who in the early days "struck it rich" by discovering a gold mine near Washoe Lake, Nevada, died recently at Reno, in that state. Harris was a well-known and much-loved man fifty years ago, as he shared his good fortune with his associates and friends. When his mine failed, he continued prospecting, but latterly had depended on the more practical, if less romantic, business of assaying and cattle raising.

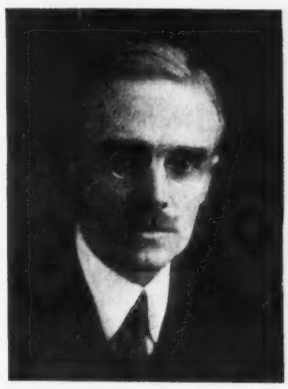
Leonidas Merritt, widely known throughout the Mesabi range region of Minnesota as "Lon" Merritt, died on May 9, at Duluth. He was eighty-two years old. Mr. Merritt is credited with the original discovery of iron ore on the Mesabi range. He was born in Chautauqua County, N. Y., going to Minnesota, with his father in 1855. With his eight brothers he discovered commercial deposits of ore in 1890. They were able to finance mining operations, but lost all in 1893. Through many vicissitudes "Lon" Merritt "carried on." He paid off more than a million of the family's debts and when over eighty years old acted as City Finance Commissioner of Duluth.

Herbert Moir's recent death in London has recalled in Australia the heyday of the Western Australia gold-mining boom thirty years ago, when he was responsible for a number of promotions. The best known was Hannan's Proprietary in 1895, which acquired almost the whole of the Golden Mile of Kalgoorlie, excepting the areas owned by the Great Boulder, Golden Horseshoe, Ivanhoe, Lake View, and a few minor concerns. The promotions were chiefly remarkable for the publication of lists of subscribers to the articles of association, which consisted of 100 of the best-known names in London, each taking £100.

Edward Coppée Thurston

An Appreciation

On April 29, there died at Ross Valley, Calif., after an illness lasting many years, a man who represented the highest type of an engineer—a man of culture, and a gentleman in the true meaning of that word, whether in action or instinct. Edward Coppée Thurston



Edward C. Thurston

was a man liberal, sympathetic, and charitable in his judgment of others, generous in action, and a devoted husband and father. He is survived by his wife, née Alice Merry, and by a daughter whose mother was Lois Raymond, of Morristown, N. J.

Though a literary career attracted him, Mr. Thurston chose mining as a profession, not so much because of its appeal as a life's work in itself, but rather because of the romance connected with it, and of the probability of chances for extensive travels to the far places of the earth. Fortunately, he experienced both the travel and the excitement attending such a career. His early work carried him to South Africa, Europe, China, Mexico, and of course to places in his own country distant from civilized centers—pioneering in fact. He was an eager and intelligent investigator, and entered into his professional work with energy, with a spirit of scientific research, and with the most absolute integrity, seeking the facts as disclosing the truth when making his examinations of mining properties, and reporting facts as he saw them, uninfluenced by the hopes or wishes of those for whom his work was done.

Mr. Thurston was an exceedingly kind and tactful man. His thoughtfulness and reverence for women was a distinguishing characteristic. He was of a modest and retiring nature, sunny, trustful, and optimistic. His was a truly fine character.

Edward Coppée Thurston was born at South Bethlehem, Pa., Oct. 28, 1874, and after receiving a common-school education, he went to Lehigh University, of which his grandfather, Dr. Coppée, was president. After graduating in the class of '96, with the degree of mining engineer, he went to the famous mining school at Freiberg, Saxony, where he spent two years. At that time Freiberg was considered the "last word" in the line of mining education. After graduation, and on the advice of John Hays Hammond, Thurston went out to Johannesburg, Transvaal, and with Mr. Hammond's influence obtained a position as assistant engineer at the Robinson Deep, and later at the Simmer & Jack Consolidated subsidiaries of the Consolidated Gold Fields of South Africa. Later, Thurston went to Rhodesia as an examining engineer.

During the Boer War he returned home, made a tour around the world, and later, in the line of his profession, visited mines in Mexico; and in 1904 and 1905 was assistant engineer on an exploring trip in China. After carrying on some private practice, he joined the engineering staff in Colorado of the Empire Zinc Co., a subsidiary of the New Jersey Zinc Co. After being with that company a number of years, and after having married, he went into private business, but found mining more to his taste and returned, as so many do, to the fold, engaging in private practice as a consulting mining engineer, during which time he visited many properties in the United States, Mexico, and various countries of South America.

About 1911, he accepted the position of consulting engineer with the house of Goerz & Co., in London, with whom he remained until the breaking out of the Great War, when he gave up his professional work to actively take part in relief work in Belgium and northeastern France, under Herbert Hoover. On account of ill health he was forced, about the middle of 1916, to retire and return to the United States to recuperate. In 1917, he started back to Europe, but was persuaded on account of his health to remain in this country, and he became associated with Yeatman & Berry in their engineering work.

In 1918, though still very much out of health, he went to Washington and joined the Non-Ferrous Metals Section of the War Industries Board as chief engineer. He remained with that organization until it disbanded early in 1919, when he returned to his old firm, with whom he remained until June, 1920, when ill-health compelled him to go to California, where for some time he was with Colonel S. W. Mudd; but in 1921 he was compelled to retire absolutely from all work. He was always hopeful, but was never able to regain his health, and so after many years of suffering, he passed away at the home of his relatives in beautiful Ross Valley, the place he loved most in the world.

During a large part of his professional life Coppée Thurston was closely associated with me, and since he left college we were close friends. In his death I feel the loss of a friend whose personality I loved and whose character I revered. POPE YEATMAN.

Recent Technical Publications

Reviews, Abstracts, and References

Lake Superior Mining—Vol. 24 of the *Proceedings* of the Lake Superior Mining Institute, Ishpeming, Mich., contains a list of members and reports of meetings, as well as the following papers: "The Future of the Lake Superior District," by M. C. Lake, pp. 20; "Calumet & Hecla Reclamation Plant," by C. H. Benedict, pp. 21, describing how tailings running one-half of 1 per cent copper are dredged, tabled, floated, and leached, at a profit; "Stratigraphy and Correlation of the Cuyuna Iron Ore District, Minnesota," by Carl Zapffe, pp. 17; "Measurement of Geological Age by Atomic Disintegration," by Alfred C. Lane, pp. 11; "Moffat Tunnel Progress," by Douglas C. Corner, pp. 4; "Present Scraping Practice at the Cliffs Shaft Mine," by Lucien Eaton, pp. 5; "Recent Developments in Blasting," by J. R. St. Clair, pp. 3; "The Principles of Mine Fan Installation," by Clyde W. Nicolson; "The Lake Superior Geosyncline," by W. O. Hotchkiss, pp. 9; "Certain Advances in Geological Information Relative to the Lake Superior Iron Deposits," by Stephen Royce, pp. 33; "Michigan Iron Mining Industry," by L. P. Barrett, pp. 18; "The Iron Ranges of Northwestern Ontario," by J. E. Marks, pp. 9; "The Marquette Iron Ore Range," by George A. Newett, pp. 26; "The Ontario and Quebec Gold Fields," by William H. Selden, Jr., pp. 36; "Forestry and the Mining Industry in the Lake Superior Region," by Raphael Zon, pp. 9; and "Exploration for Iron Ore in the Lake Superior District," by Ralph S. Archibald, pp. 9.

Alberta Map—A geological map of the province of Alberta, scale 25 miles to the inch, has recently been published by the Scientific and Industrial Research Council of Alberta, Edmonton, Alta., from which it may be obtained, presumably on request.

South African Geology—"The Economic Geology of Sabie and Pilgrims Rest" is discussed by W. J. Wybergh in Memoir No. 23, Department of Mines and Industries, South Africa, price 5s. 6d. from the Government Printer, Pretoria. The bulletin is of 124 pages and supplements Memoir No. 5 of the Transvaal Geological Survey, published in 1910, in which A. L. Hall discussed the geology of this gold district. Numerous maps and charts are included in the volume.

Deep Level Hoisting—J. A. Vaughan has the first of a series of continued articles on "Raising Ore Through Deep Shafts," in the March 10 issue of *The Mining and Industrial Magazine* (Johannesburg; price 6d.). These articles contain up-to-date data on shaft depths and hoisting practice on the Rand.

Hoisting Ropes—Robert James has a paper on "Haulage and Winding Ropes" in the Feb. 16 issue of the *Proceedings* of the South Wales Institute of Engineers, pp. 37. (Park Place, Cardiff, Wales; price 5s.) He covers British colliery practice, giving many data on the various kinds and designs of wire rope and their uses.

Iron Mining—*The Mining Congress Journal* for April (Washington, D. C.; price 30c.) contains two articles on iron mining: "The Mesabi Iron Company Enterprise," by W. G. Swart, pp. 6, and "Changes in the Treatment of Wash Ores," by Harry W. Newton, pp. 3.

In the *Iron Trade Review* of April 8 (Cleveland, Ohio; price 25c.) Olin R. Kuhn has a four-page article entitled "Vast Iron Ore Reserve in South America Undeveloped." The deposits are said to be the largest high-grade iron ore reserves possessed by any of the continents, situated principally in Brazil, Peru, and Chile. The total is put at 5,220,000,000 tons of metallic iron. Deposits of coking coal, however, are scarce.

Alaskan Mining—Bulletin 783-A, obtainable on request from the U. S. Geological Survey, Washington, D. C., is a report on the "Mineral Industry of Alaska in 1924," together with an administrative report, by Philip S. Smith. Though it has just been issued, in April, 1926, it is stated in the introduction that "this volume . . . has for its chief purpose the prompt publication of the more significant economic results of the year." The value of mineral production in 1924 was about $17,457,000, or about $3,000,000 less than in 1923, the decrease being attributable to a lessened output of copper, though the value of copper still surpassed that of gold.

Grinding Gypsum—H. J. Brown, in *Rock Products* for April 3, 1926 (Chicago; price 25c.), in an article on the "Ball-mill Grinding of Raw Gypsum," gives data obtained in a test at Columbia University a few months ago, showing that gypsum may be ground efficiently without driving off the water of crystallization.

Mining in California—We are informed by the California State Mining Bureau that the quarterly advance chapters of the annual report of the State Mineralogist, issued under the title "Mining in California," are obtainable for 25c. per copy, and not free, as recently stated in these columns.

Geology—The February *Bulletin* of the Institution of Mining and Metallurgy (225 City Road, London, E.C.1) contains 32 pages of discussion of H. C. Boydell's paper on "The Rôle of Colloidal Solutions in the Formation of Mineral Deposits"; a five-page paper by S. J. Speak on "An Occurrence of Zinc Silicate Ore of Supposed Primary Origin" (separates of which are obtainable for 1s.); and "Liquation in Molten Alloys and Its Possible Geological Significance," by Sydney W. Smith, pp. 48, obtainable for 2s. 3d. each. The March issue of the *Bulletin* contains a 21-page paper by Stopford Brunton entitled "The Gold Deposits of Nova Scotia: A New Hypothesis Concerning the Structural Features of the Province." Separates are obtainable for 2s. each. The bulletin also contains several pages of discussion of the papers in the February issue.

Patents

Dry Jig—No. 1,579,660. April 6, 1926. J. F. Reilly, Tucson, Ariz., assignor of one-half to John A. Forney, Tucson. A combined jig and aspirator, including a hopper and vibratory jig, and a blower adapted to supply air at slight pressure over the jig for carrying off the gangue.

Charging Device — No. 1,579,970. April 6, 1926. Filip Tharaldsen, Bestun, near Christiania, Norway. A hopper and screw feed device for metallurgical furnaces, the pitch of the screw thread being smaller at both ends than in the intermediate portion of the screw.

Lead Refining—No. 1,580,138. April 13, 1926. Henry Harris, London, England. A method of removing impurities alloyed with molten lead by using as an oxidizer an alkali oxy-salt of a different lead-alloying ingredient from the one or ones to be removed.

No. 1,583,495. May 4, 1926. H. M. Schleicher, Monterey, Mexico, assignor to American Metal Co., Ltd., New York. Molten lead is held in contact with a reagent capable of absorbing oxidized impurities, in the presence of an oxidizing agent. Impure lead is added to the bath at substantially the same rate as the impurities are absorbed.

Electrolytic Copper—No. 1,580,614. April 13, 1926. Frederick Laist and F. F. Frick, Anaconda, Mont., assignors to Anaconda Copper Mining Co., Anaconda, Mont. Copper ore is leached with acid and a reagent added capable of precipitating iron, before electrolysis. Ground limerock is added to the acid solution, for example, and the mixture agitated and filtered, the filter cake then containing, in addition to the iron, aluminum, arsenic, and phosphorus compounds.

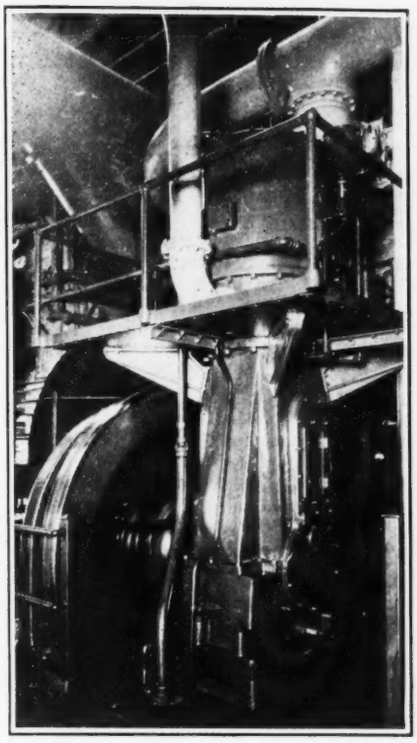
Hafnium Separation—No. 1,580,650. April 13, 1926. Dirk Coster, Haarlem, Netherlands, and Georg von Hevesy, Copenhagen, Denmark, assignors to Naamlooze Vennootschap Philips' Gloeilampen - Fabrieken, Eindhoven. Hafnium and zirconium are separated by progressively fractionally separating one of the elements as hydroxide and collecting the separated fractions.

No. 1,582,860. April 27, 1926. A. E. van Arkel and J. H. de Boer, Eindhoven, Netherlands, assigned as above. A mixture of hafnium and zirconium halogenides is separated by adding at least one of the halogenides of the elements of the fifth and sixth group of the periodic system, whereupon the separation of the mixture thus produced is obtained by fractional distillation.

Metallurgical Furnace—No. 1,581,397. April 20, 1926. Xavier de Spirlet, Brussels, Belgium. A process of heating fuel and powdered ore in which a thin layer of the material is exposed to the action of a gas, the residue being removed without the employment of hand labor, and the carbon or sulphur being completely burned without the formation of slag or agglomerations.

Rock Drill—No. 1,581,668. April 20, 1926. L. C. Bayles, Easton, Pa., assignor to Ingersoll-Rand Co., Jersey City, N. J. Design of a hammer drill.

New Machinery and Inventions



Vertical rotative dry-vacuum pump driven by direct-connected synchronous motor

An Interesting Dry-Vacuum Pump

Two large dry-vacuum pumps of special design has been developed by the Worthington Pump & Machinery Corporation for central-station use. The station in which this installation has been made is equipped with two 50,000 sq.ft. Worthington surface condensers, one for each of the two 30,000-kw. turbo-generators. From these condensers the air and non-condensible vapors are removed by two convertible, motor-driven rotator dry-vacuum pumps. one for each condenser.

The air end of the pumps is similar in principle to the Worthington two-stage single-cylinder horizontal feather-valve dry-vacuum pump, with the exception that the cylinder is arranged vertically and additional valves are located in the piston itself. The vertical arrangement of the cylinder was adopted to economize in floor space required.

The air-suction pipe from the condenser enters the upper portion of the pump cylinder, the air being drawn in on the "down" stroke of the pump. On the "up" stroke of the pump, the air flows from the upper side of the piston to the lower side through the feather valve located in the piston itself. On the down stroke, this air is compressed and delivered to atmosphere, the design being such that a two-stage effect is produced in one cylinder. There is practically no compression in the first stage. This eliminates the loss in volumetric efficiency which occurs in pumps of the single-stage type when the air re-expands in the clearance space.

Direct-connected motor drive is used, a General Electric synchronous motor operating at 120 r.p.m. being mounted on the pump shaft. With an absolute pressure of 0.7 in. of mercury being maintained in the condenser, the motor takes the remarkably low input of less than 21 hp. On closed suction the pump is capable of maintaining an absolute pressure of 0.1 inch of mercury.

Rotary Converters in Mine Work with Load Control

The first use in mining service of load control with rotary converters will be made by a coal company, the Benedict Coal Corporation, at St. Charles, Va. In the substation of this property, soon to be placed in operation, there will be two 200-kw., 275-volt rotary converters with full automatic control, each machine being provided with protective devices to permit the obtaining of maximum power output without damage to the apparatus.

Normally a single machine will run to handle the load of three feeders. If, however, the load should exceed the capacity of this machine, the automatic equipment is arranged to start the second unit after a definite time delay has expired. This time delay prevents starting the second machine unnecessarily by momentary overloads. When the power is no longer needed, the second unit will automatically shut down.

Should the load increase to exceed the safe carrying capacity of both machines, one of the outgoing feeders will be automatically tripped, thus reducing the load to a safe value and, at the same time, not interrupting service on the other two feeders. Should an overload occur when one machine is running alone, two feeders will be tripped off and service will not be interrupted on the third feeder.

Should the running unit be shut down because of a hot bearing, winding failure, or other cause, the second unit will automatically start and restore service. Either machine may be made "leading," and both units may be run continuously if necessary. The entire station may be shut down by opening a small control switch located at some distance from the station.

Portable Flotation Mill

For small operations and also as a pilot plant for larger properties undergoing development, the Southwestern Engineering Corporation, of Los Angeles, Calif., is placing on the market a portable flotation mill. The mill is a complete unit with the exception of power, and will treat up to 25 tons per twenty-four hours. Included in the equipment is a hopper, primary crusher, belt feed, ball mill, classifier, double-compartment oil feeder, and a K. & K. flotation unit. A concentrating table can also be included if necessary. The power can be supplied by a steam, oil, or gas engine, depending on which is most desirable for any particular locality. It is the intention of the company to design this mill so that it can be handled by mule pack and readily assembled in a comparatively short time. No concrete foundations are required, as the mill is assembled on steel I-beams.

Saws Six Times as Fast as a Man Can Saw by Hand

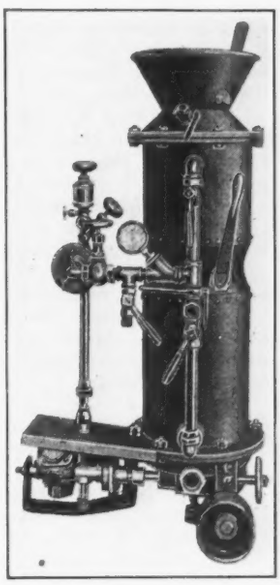
An electrically-driven, hand-guided wood-cutting device known as the Skilsaw has been developed and is now being marketed by the Michel Electric Hand Saw Co., 3814 Ravenswood Ave., Chicago, Ill. This device is a combination in one machine of an 8-in. circular saw and a ½-hp. universal motor, each the product of a well-known manufacturer. The saw may be set to cut to any depth from nothing up to 2¾ in. The tool complete weighs 19 lb. and consequently is readily portable.

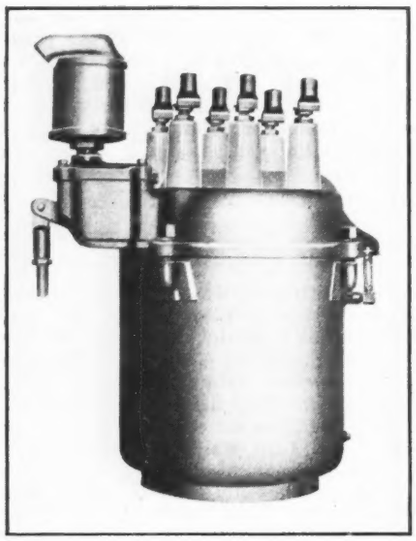
This machine is now being used in no less than forty-three different businesses. About the mines it will prove particularly useful in car building as well as in construction and repair work. It is approximately six times as rapid as fast hand-cutting. Unlike a hand saw, however, it can be adjusted to cut to an exact depth. Thus for instance, it can be so set as to just cut through a floor without touching the concrete beneath or nicking the joists.

Efforts are continually being made to relieve human muscles of the work that it was once thought they alone could perform. The power hand saw is one of the latest steps in this direction. It is doubtless destined to receive wide adoption in many arts and trades.

This New Cement Gun Requires Small Amount of Air

A one-drill compressor is claimed to furnish sufficient air for the operation of new type N-00 cement gun manufactured by the Cement-Gun Co., Inc., Allentown, Pa. It is of especial advantage to contractors for the repair of honeycombed concrete and for other small patch work, because of its easy portability. Sixty cubic feet of free air per minute is given as the required air supply of the machine. Its operation is identical to that of the larger machines, and it is claimed that it is as efficient in operation. Its weight is 200 lb.





Oil circuit breaker completely assembled

Multipole Oil Circuit Breaker with Single Tank

One of the features of the new multiple oil circuit breaker of the Westinghouse Electric & Manufacturing Co. is the inclosing of the three poles in a single round tank. This arrangement is designed to give the breaker increased rupturing capacity and increase the electrical clearance between the terminal connections, with small space requirements. The single circular tank with domed bottom and top resembles boiler construction to give strength for resisting internal pressures.

The domed frame permits using space, heretofore not utilized, about the contact studs for additional volume in the air-expansion chamber above the oil, and also allows the system of operating levers to be inclosed within the breaker chamber, all without increasing the over-all height of the breaker.

A main shaft, brought through the frame, with a single operating lever outside and well away from the live terminal connections and the remainder of the levers within the breaker, results in the removel of grounded moving parts from the vicinity of the bus connections. By this means the air-insulating distances outside the breaker are increased and an oil-tight structure is obtained. The single round tank for all poles provides for the efficient use of the oil, the insulating properties of the entire volume of oil being available for each pole. This construction also simplifies such maintenance features as renewal of oil, maintaining the oil level, and the inspection of contacts.

High-Lift Electric Hoist

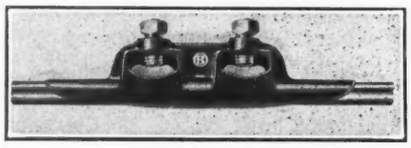
A new line of electric hoists has been placed on the market recently by the Northern Engineering Works, of Detroit, Mich. This line is known as the "Hi-Lift." It embodies all the essential features found in this concern's successful five-ton crane design and in addition has an extremely high lift. Any standard make of motor can be used with it.

Splicer with Cam-Grip Holds Trolley Wire Tight

A cam-grip splicer for securing the ends of trolley wires and based on a new principle is a recent development of the Ohio Brass Co., of Mansfield, Ohio. The operation of this splicer depends upon the action of a serrated cam on the trolley wire rather than on the direct pressure of set screws. The cam or dog is of hardened steel carrying milled teeth. It is confined in a pocket in the body of the splicer and is held down against the trolley wire by means of a single heavy hardened steel set screw.

The eccentric action of this cam comes into play when the wire is pulled, so that the greater the tension on the wire, the stronger becomes the grip. The strength is not dependent on the force used in tightening the set screw but upon the wedging action of the dog when the wire is in tension.

The wires enter cored holes in the body casting and the lips are formed by a V-shaped opening in the underrun, ground to a taper toward the ends of the splicer. No peening of the lips is necessary, as the opening is made for a snug fit around the wire. The cam forces the wire down against the bottom of the opening, with the result that there is said to be an easy transition of the trolley wheel onto and off of the splicer.



Steel teeth bite into copper wire with bulldog grip

In this splicer the cap screws do not bear on the trolley wire direct but through rocking cams provided with milled teeth. The greater the tension pulling the two wires apart the firmer the grip of these cams.

Timing Gears for Gas Engines

In manufacturing timing gears for internal-combustion engines, the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has developed a new design and method of construction. This consists in forming the rim in which the teeth are cut of a multiplicity of short segments each about 1 in. in length, making eighteen or twenty segments to a 6-in. blank in place of the four segments formerly used. In addition, the new design embodies a thin pressed-steel web, affording a greater degree of lateral flexibility for gear-tooth alignment than is obtained in either the all-composition or the cast-iron center types.

High-Speed Blower Introduced

The Clarage Fan Co., Kalamazoo, Mich., has brought out a new high-speed, forced-draft unit called the type FD blower. This blower is designed for forced draft in steam boiler plants and is said to have an efficiency of over 70 per cent through an 80 per cent change of volume. The fan is also said to be designed so that it is impossible to overload it and thus it does not require such a large prime mover as would otherwise be necessary. Finally, it is designed so that it develops a rising pressure curve, so that, when the resistance increases while the fan is operating, only a slight decrease in air volume is experienced. Thus the fan can provide the necessary air for peak loads. This fan is furnished in a complete line of sizes.

New Bulletin on Shovel

The Butler shovel or underground loading machine which was described at length in the *Engineering and Mining Journal-Press* of Sept. 22, 1923, and the manufacture of which has since then been undertaken by the Nordberg Manufacturing Co. of Milwaukee, Wis., is the subject of a bulletin (No. 40) recently issued by that company.

An Elevating Platform Truck

It is a great convenience at times in shops and warehouses to have an elevating platform truck available for moving heavy loads about the floor. The Yale & Towne Manufacturing Co., Stamford, Conn., has recently brought out a truck of this type which is designated as the Yale K 23 E. This machine is not of the high-lift type, but does embody desirable self-loading features. The time taken to pick up or drop a skid with this truck is said to be comparatively small. The machine is narrow in width and has a short turning radius. It is stoutly built and easily steered. An effort has been made to make the control simple, positive, and direct.

Smelters, warehouses, and sampling plants offer opportunities for an elevating truck of this type

The Market Report

Copper Business Much Greater; Lead Prices Decline

Ending of General Strike in Britain Expected to Improve Sales in Coming Week, Both Here and Abroad

New York, May 12, 1926—Copper and lead have sold in satisfactory volume during the week ending today, in spite of the anxiety in industrial circles caused by the British general strike. With the news this morning that it has been called off, followers of the market expect to see a marked improvement in metal buying in the next few days. Prices of lead have declined somewhat, but seem firm at current levels. Zinc and tin have both been largely neglected this week. Silver is slightly lower than a week ago.

Daily Prices of Metals

May	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
6	13.575	62.75	64.25	7.85	7.55@7.60	6.75@6.80
7	13.55	62.50	63.875	7.85	7.55@7.60	6.75@6.825
8	13.525	62.625	64.00	7.85	7.55@7.60	6.75@6.80
10	13.55	62.25	63.75	7.85	7.55@7.60	6.75@6.775
11	13.65	62.50	64.25	7.75	7.55	6.75@6.80
12	13.65	61.75	63.50	7.75	7.55	6 75@6.80
Av.	13.583	62.396	63.938	7.817	7.567	6.775

The prices correspond to the following quotations for copper delivered: May 6th, 13.825c.; 7th, 13.80c.; 8th, 13.775c.; 10th, 13.80c.; 11th and 12th, 13.90c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

May	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
6	56⅝	57½	64¼	273¾	266¾	27⅜	28¼	32⅛	32 7/16
7	56⅝	57½	64¼	271½	265½	27⅜	28¼	32	32 5/16
10	56½	57⅜	64¼	269¾	264	27⅜	27 13/16	31⅞	32 3/16
11	56½	57⅜	64¼	273	267¼	27⅞	28 5/16	31⅞	32¼
12	56⅞	57⅞	64½	275¾	270½	28¼	28 11/16	31 15/16	32 5/16

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

May	Sterling Exchange "Checks"	Silver		Gold London	May	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
6	4.84½	64⅞	30 3/16	84s10d	10	4.84⅝	65¼	30 7/16	84s11½d
7	4.84⅝	64¾	29 15/16	84s11½d	11	4.85⅛	65⅜	30⅛	84s10d
8	4.84⅝	65¼	30 3/16	.....	12	4.85⅛	65⅜	30 5/16	84s11½d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Copper Held at 13⅞c. Today

Most sellers of copper have been openly quoting 13⅞c. delivered in the East and 14c. in the Middle West all week, but concessions have been made in numerous instances. Still, the full price was obtained in many sales, and there is particularly a tendency to hold out for these levels today, as inquiries have improved greatly owing to the ending of the British strike. The volume of business has been better than for any other week in the last four months, much of it being done this afternoon, and is expected to continue heavy, as consumers are sailing very close to the wind; some are asking for immediate shipment and others have barely enough left for their May requirements. Some let-up is reported in orders for copper sheets and wire, though the brass market seems to be about as active as ever.

The foreign market has been somewhat improved, though it is still quiet. Competition has led American agencies to cut prices below the levels of last week, sales being made in Europe as low as 13.95c., c.i.f. during the week.

Refinery stocks of copper decreased by about 2,600 tons last month, and as they are now only about two or three weeks' supply, there is little pressure on the market, which is one reason for the recent price steadiness with only a small volume of sales. Export shipments were about the same in April as March, 43,834 tons, but domestic shipments were only 75,030 tons, a decline of 13,543 tons. Primary production at refineries was 112,391 tons, compared with 117,897 in March.

Lead at 7¾c., New York

Though London advanced yesterday, the American Smelting & Refining Co. cut its price on New York lead from 7.85 to 7.75c., probably owing to insufficient business at the higher level, to a weaker market in St. Louis, and to a desire to withdraw further support of the London market. Some sellers have done a very good business during the week, whereas others have not sold as much as they would have liked. The 7.85c. price has generally obtained as a New York basis, though slight premiums have been obtained in some instances on small tonnages for immediate shipment. In the Middle West, business has been very fair at 7.55@7.60c., St. Louis, the lower level generally obtaining yesterday and today. Rumors of lead at 7.50c. are heard, but reports of actual sales at that level have not so far been received. Requirements of battery manufacturers are decidedly lighter than earlier in the spring, and sales to white-lead makers continue somewhat unsatisfactory. Other classes of consumers, however, are active, though not disposed to buy very far ahead. Prices are about the same, whether for May, June, or July shipment. Corroding grades command the usual premium of $2@$3 per ton.

Zinc Quiet at 6.75@6.80c.

Neither galvanizers nor brass makers have taken much interest in the zinc market during the week and the price has held steady at 6.75@6.80c. most of the time, with only moderate sales. The statistics issued by the American Zinc Institute are as follows, in tons of 2,000 lb.:

Stock, April	20,561
Produced	53,334
Shipped	47,905
Stock, April 30	25,990
Shipped from plant for export	3,934
Stored for customers	958
Retorts operating April 30	89,333

The stocks increased somewhat, but are still small; production, however, would still seem to be greater than justified, being at about the same rate as at the end of March. High-grade zinc has been quiet at 8¼@8⅜c., delivered, during the week.

Tin Market Dull

A fair business has been done in tin, but in general the market has been quiet, with the large premium on early deliveries of Straits continuing. A differential of about 4½c. has existed between spot and July Straits, though Banca and 99 per cent are somewhat easier to obtain. The English smelters have not been affected by the strike, except that it has prevented their shipping their product. With transportation again possible, a somewhat easier condition in spot metal is anticipated early in June.

Sterling Held Well

Sterling exchange was hardly affected by the strike, but French francs suffered again. Closing cable quotations on Tuesday, May 11, were as follows: francs, 3.14¼c.; lire, 3.99⅞c.; and marks, 23.81c. Canadian dollars, $\frac{3}{32}$ per cent premium.

Silver Quiet

A reversal of China's position on May 6 caused a sharp decline in silver on that day. Prices have moved higher since, but fluctuations have been relatively wide during the last week. India has bought in both London and New York, and according to advices from abroad the bazaars are still moderate buyers. The market closes quiet.

Mexican Dollars: May 6th, 49½c.; 7th, 49⅝c.; 8th, 50c.; 10th, 50⅜c.; 11th and 12th, 50½c.

Other Metals

Quotations cover large wholesale lots unless otherwise specified

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, 98 per cent, £118 per long ton.

Antimony—Per pound, duty paid, New York: Chinese brands, spot, 13@12.5c. June arrival, 12.5@12.25c. Cookson's "C" grade, spot, 21¾c. Market very dull and prices purely nominal. Spot particularly weak. Battery trade dull.

Bismuth—$2.70@$2.75 per lb., in ton lots. London, 10s.

Cadmium—60c. per lb. Market good. London, 1s. 9d. for Australian metal.

Iridium — $175@$180 per oz. for 98@99 per cent. Nominal. London, £70@£75 for 99.5 per cent.

Nickel—Ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent); market less active. London, £170@£175 per long ton.

Osmium—$80@$85 per ounce, nominal; London, £19@£22.

Palladium—Refined, $67@$69 per oz. Crude, $60@$65 per oz. London, £14@£16¼, nominal.

Platinum — Per ounce refined, officially quoted: $110. Sales also at $105@$106. Crude, $103.50. London, £22½@£23½ for refined; crude, £21@£22.

Quicksilver—Per 75-lb. flask holding steady at $90.75@$92. San Francisco, $90.67. London £15@£15⅛.

Ruthenium — $75@$85 per ounce; London, £13@£16.

The prices of Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Radium, Rhodium, Selenium, Tellurium, Thallium, Tungsten, and **Zirconium** are unchanged from the issue of May 8.

Metallic Ores

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite, $10.75@$11; Western scheelite, $11@$11.50. Domestic demand very light, and prices largely nominal.

Vanadium Ore—Containing 4 to 8 per cent V_2O_5, 30@35c. per pound of V_2O_5 f.o.b. Montrose, Colo.

Foreign concentrate (lead vanadate) 12 to 18 per cent V_2O_5, 60@65c. per pound V_2O_5, duty paid, seaboard.

Chrome Ore, Manganese Ore, Molybdenum, Tantalum, Uranium, and **Iron Ores** are unchanged from quotations in the May 8 issue.

Zinc Blende and Lead Ore Prices Unchanged

Joplin, Mo., May 9, 1926

Zinc Blende

High	$50.90
Premium blende, basis 60 per cent zinc	$46.00@47.00
Prime Western, basis 60 per cent zinc	45.00
Fines and slimes, 60 per cent zinc	44.00@42.00
Average settling price, all zinc	45.26

Galena

High	$101.70
Basis 80 per cent lead	92.50
Average settling price, all lead	98.28

Shipments for the week: Blende, 15,154; lead, 1,634 tons. Value, all ores the week, $846,440.

Sellers were inclined to withhold zinc concentrates from the market, with the result that 13,550 tons only, of a production of 15,390 tons, were sold.

Offerings for lead continued on the $92.50 basis and brought a very light tonnage on the market, the shipment from last week's purchase being one of the smallest of the year.

Platteville, Wis., May 8, 1926

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$47.50
Lead Ore	
Lead, basis 80 per cent lead	$92.50

Shipments for the week: Blende, 1,225 tons; lead, none. Shipments for the year: Blende, 19,008; lead, 512 tons. Shipments for the week to separating plants, 1,831 tons blende.

Correction: In the Platteville letter dated March 20 and published in the issue of March 27, the price of blende was incorrectly given as $56.50. The figure should have been $50.50.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystal, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli, and **Zircon** are unchanged from prices in the May 8 issue.

Mineral Products

Arsenious Oxide (White arsenic)—3½c. per lb. Practically no business. London, £14@£15 per long ton.

Copper Sulphate, Sodium Nitrate, Sodium Sulphate, and **Zinc Oxide** are unchanged from prices in the May 8 issue.

Ferro-Alloys

Ferromanganese — Domestic, 78@82 per cent, $88@$90 per gross ton furnace; prompt and future.

Ferrocerium, Ferrochrome, Ferrophosphorus, Ferrosilicon, Ferrotitanium, Ferrotungsten, Ferro-uranium, Ferrovanadium, and **Spiegeleisen** are unchanged from prices in the May 8 issue.

Metal Products

Rolled Copper — Sheets, 22½c.; wire, base price, 16c. per lb.

Zinc Sheets — 11.25c. per lb., f.o.b. works.

Lead Sheets, Nickel Silver, and **Yellow Metal** are unchanged from prices in the May 8 issue.

Refractories

Chrome Brick, Firebrick, Magnesite Brick, Silica Brick, and **Zirkite** are unchanged from prices in the May 8 issue.

Iron Trade Quiet—Pig Iron and Coke Dull

Pittsburgh, May 11, 1926

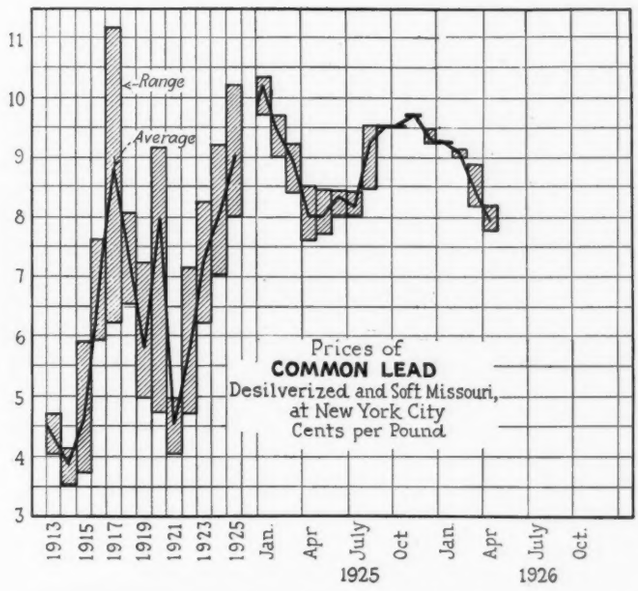
Production of 4,123,941 gross tons of steel ingots in April represented a reversion to the January-February rate, March being about 6 per cent above. Production in the six months beginning with November was 6.1 per cent above the record previously made for six months, in the first half of 1923.

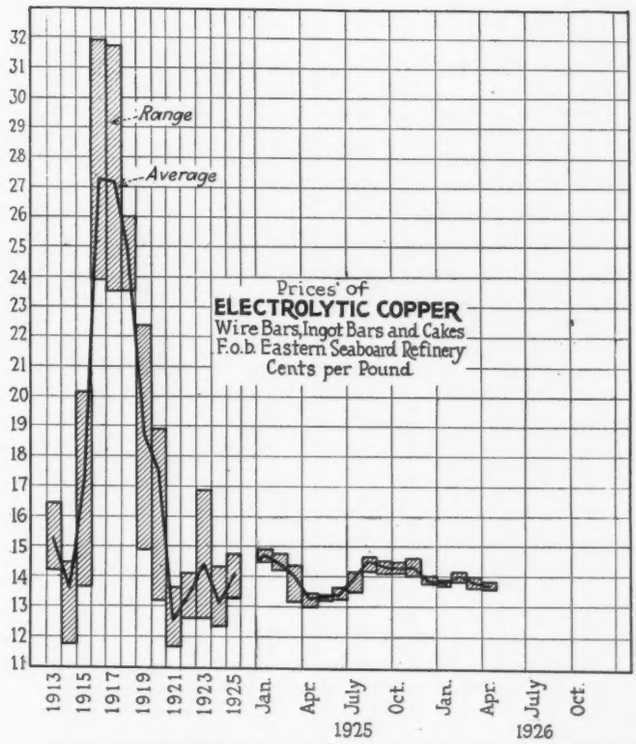
Sheets have lost nothing in price since the decline reported a week ago. Merchant steel bars, having been softening for several weeks, are now quotable $2 a ton lower, at 1.90c. to 2.00c.

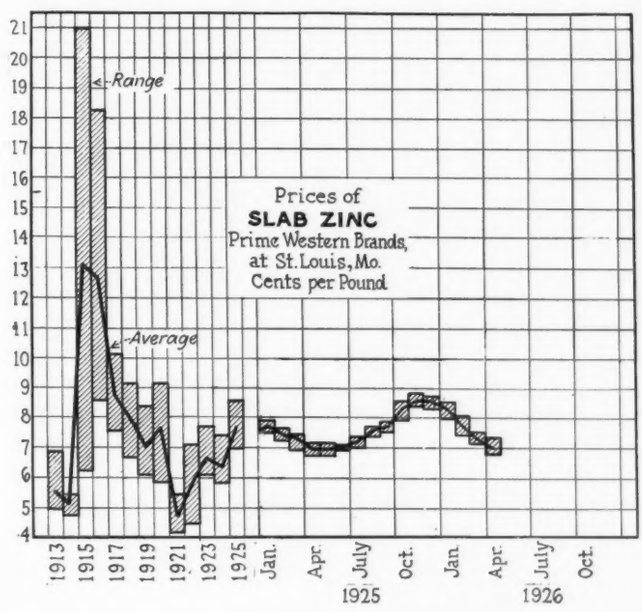
Pig Iron—The market remains very dull. Foundry iron is still being shipped against first-quarter contracts. Prices are steady, but really untested: Bessemer, $19.50; basic, $18.50; foundry, $19, f.o.b. Valley furnaces.

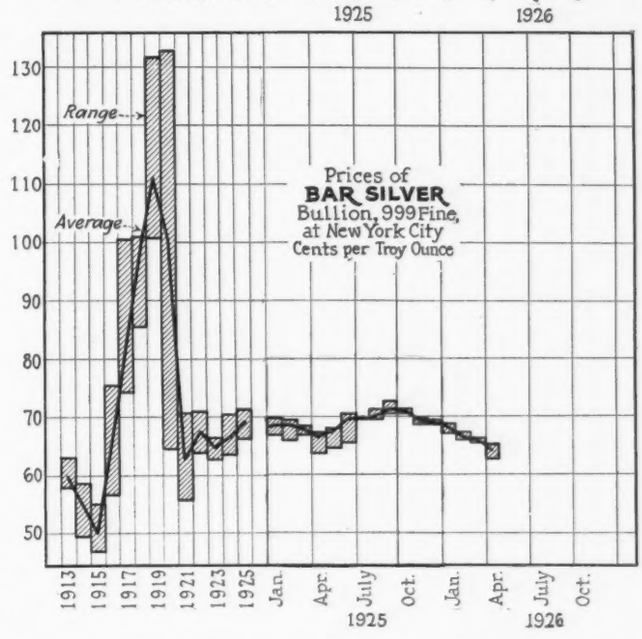
Connellsville Coke—There is no interest in contracts, and spot is a trifle easier. Furnace, $3; foundry, $4 @$4.50.

Metal Price Curves

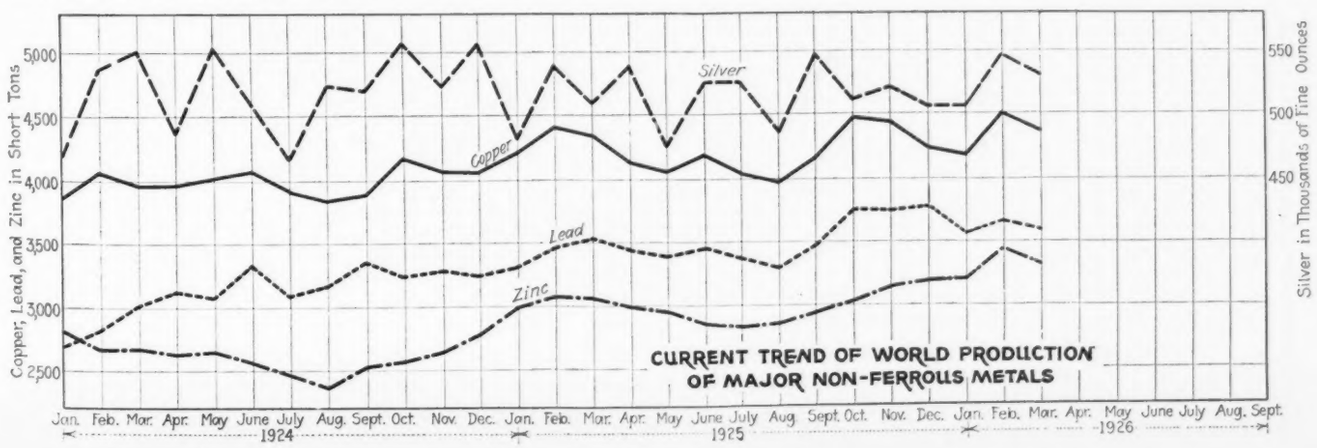








THE curves below are not to be considered as permanent records of production. They show merely the current trend in terms of daily output, according to latest estimates of the American Bureau of Metal Statistics. The figures represent countries that produced in 1923 and 1924 about 97 per cent of the world's output of copper; 78.5 per cent of the lead; 87.5 per cent of the zinc; and 81 per cent of the silver.



Review of Current Statistics

By Arthur B. Parsons
Assistant Editor

BRIEF explanation of the methods—necessarily somewhat arbitrary—used in compiling and computing the data on which they are based should add to the interest of the graphs shown on the opposite page. Designed to present at a glance current tendencies in the economic aspects of the mining industries, they are hereafter to be a monthly feature of the Market Section. They supplement the curves of metal prices and world production rates that appear on page 829.

Probably the most significant graph is the index of non-ferrous metal prices. Copper, lead, silver, zinc, aluminum, tin, and nickel are of decreasing moment in the order mentioned. It might be asked why platinum, quicksilver, and antimony are absent. The reason is that they are of so little comparative consequence that they are best omitted. In fact, a change of 1c. in the price of copper is as important as a change of 40c. in the price of nickel, of 30c. in the price of tin, and of 10c. in either aluminum or silver.

Methods of Calculation

With some slight modification the method adopted by government and other agencies for calculating index numbers has been used. This consists of determining (1) a "commodity weight" for each of the seven metals by calculating the gross value, at prices then prevailing, for the period 1922, 1923, and 1924; (2) the percentage that each commodity weight is of the aggregate; and (3) a factor representing the quotient of each percentage divided by the corresponding average price. To calculate the index number for any period, it is only necessary to multiply each of these factors by the current price of the metal, and to total the products.

If an outstanding change in the production rate or the price of any metal should eventuate, a revision of the factors would be desirable. One reason for using the years 1922-3-4 instead of 1913—to which most statistics hark back—is because of the fact that the price of lead has approximately doubled, whereas copper prices are about the same. Production in North and South America, only, is considered, and New York and St. Louis prices are used. Any inaccuracy introduced by the difference in foreign and domestic prices is negligible.

The index for non-metallic mineral products has been calculated in the same way, except that the base is taken as the year 1924 instead of the three-year period. The absence of several important non-metals may be noted—particularly limestone, gypsum, sulphur, nitrate, and salt. For several reasons this was considered advisable. For one thing, the commodity weight for each of these is proportionately so large that changes in the prices of the others listed would be effectively masked. This feature is more marked than in the instance of the metals. Moreover, with respect to nitrate, salt, and sulphur, the methods of exploitation are specialized, and in one sense they do not reflect the status of the mining industry; and as to gypsum and limestone, because of the wide distribution of deposits and varying qualities, prices representative of the entire industry are not easy to ascertain. The order of importance of the minerals is: phosphate rock, asbestos, talc, borax, fuller's earth, fluorspar, feldspar, barytes, and magnesite. Production of several other well-known metallic minerals, including mica and graphite, is too small to warrant incorporating them.

E.&M.J. Weighted Index of Non-Ferrous Metal Prices

100 Is Composite for 1922-3-4

1920	130.92
1921	80.80
1922	93.94
1923	103.43
1924	102.63
1925	134.38
January, 1925	116.38
February, 1925	113.50
March, 1925	110.20
April, 1925	104.75
January, 1926	112.66
February, 1926	111.91
March, 1926	108.95
APRIL, 1926	105.93

In constructing graphs to show the fluctuations in the market value of mining company shares, a method that probably is unusual was adopted. The group classed as mining-smelting-manufacturing companies includes in order of importance: Anaconda, New Jersey Zinc, American Smelting & Refining, National Lead, American Metal, International Nickel, and United States Smelting. This sequence, prevailing in 1924, is the same today except that International Nickel has passed American Metal and National Lead.

Wide Range of Prices

During 1924 the average value of International Nickel shares was about $16.50, and of New Jersey Zinc, $154; the others ranged between. Obviously, it would be useless to use an arithmetic average of the market prices in an effort to indicate a composite of the public's appraisal of the value of the shares. Accordingly, the gross stock-market valuation of the total outstanding shares of all the companies is determined and this figure is converted to a percentage of the average for 1924. This conversion is made not because the year 1924 is viewed as a particularly suitable standard, but because it is desirable to be able to introduce new companies or to drop some of those included in the present list. This can be done with the minimum of readjustment with the plan described. Presumably there will be no early occasion for making any change in the mining-smelting-manufacturing group; but it is obvious that in the other groups, which include companies whose operations are not so permanent in character, some changes may be desirable. A peculiar situation arises in connection with the Consolidated Mining & Smelting Co. of Canada. In January, 1925, shares were selling at $64; recently they have sold at $208. This remarkable rise can be explained by the gradual realization of the public of the immensity of the Sullivan orebody, and the enterprise based on it. The aim in selecting the stocks to include in this list is to choose those that are "seasoned"—to whatever extent mining shares can meet this requirement—and still not in the "liquidating" stage. Otherwise the resulting curve may reflect the finding of bonanza orebodies, exhaustion of a profitable old mine, or other things besides the approximate condition of the metal-mining industry. For this reason the Consolidated M. & S. Co. has not been included in the gold-silver-lead-zinc group. But, as has been explained, it can be introduced readily whenever it seems best, by virtue of the percentage basis of comparison.

Selection of Stocks

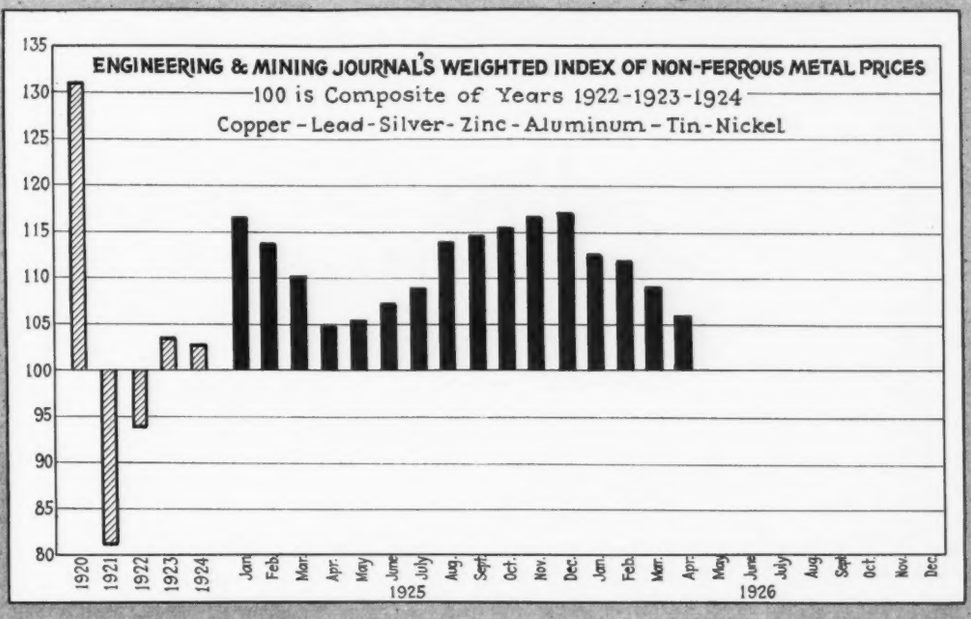
The only representative copper stocks that are not in that group are Utah Copper, Kennecott, and Phelps Dodge. Because of Kennecott's large holding of Utah stock, the market for the shares has been very narrow, and scarcely is significant. One requirement is that the stock be fairly active; a "shortcoming" in this respect likewise excludes Phelps Dodge. Kennecott by exchanging its own for Utah shares has increased its outstanding stock from less than 4,000,000 to about 4,475,000, since January, 1925, with no material decline in the market quotation. The expansion in gross share value arises mostly from the increase in assets represented by Utah stock. The acquisition of outstanding Utah shares is nearly completed, so Kennecott can soon be included in the list of coppers.

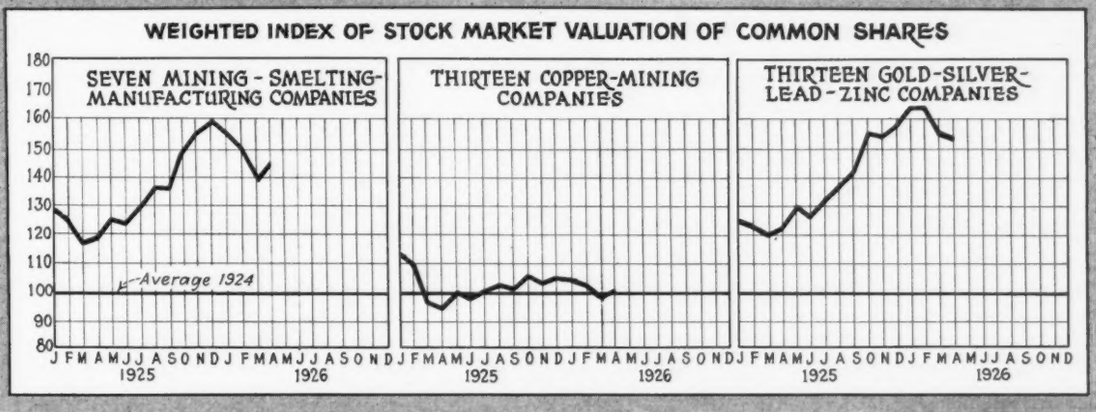
St. Joe Lead increased its outstanding shares by a stock dividend of 25 per cent during 1925, but this did not represent addition of new property, as in the case of Kennecott. St. Joe is included in the appropriate group.

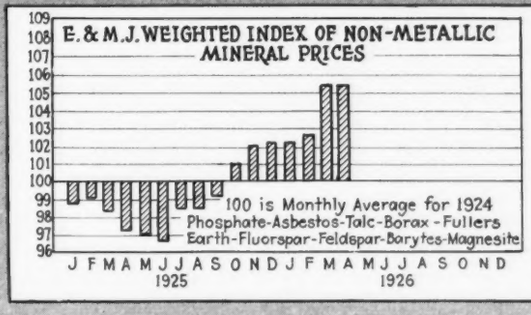
No great importance can be attached to the relative positions of the three curves with respect to the base line for 1924. It is just as logical to declare that copper stocks were "high" compared with the others in 1924 as that they have been comparatively "low" since that time. The fact that they did not rise nearly so much in 1925 as did the shares in the other groups is of much more significance. Incidentally, the use of percentages in plotting the curves enables the observer to compare at a glance the comparative rates of increase and decrease. This could not be done if the data were in terms of millions of dollars of valuation, because the difference in magnitude would distort the curves.

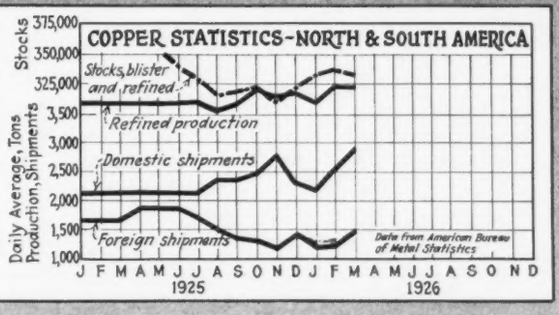
In future months it is planned to go into some detail as to the particular price changes that have affected the various indexes, and to comment briefly on the statistics of production, consumption, shipments, and stocks.

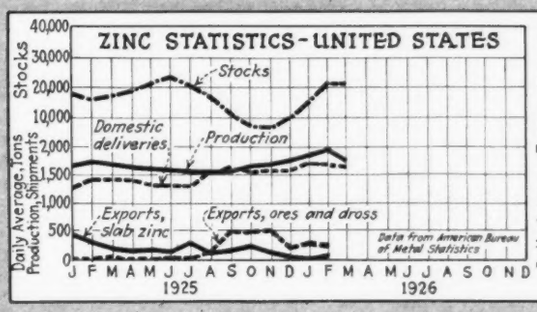
E.&M.J. Statistics of the Mining Industries

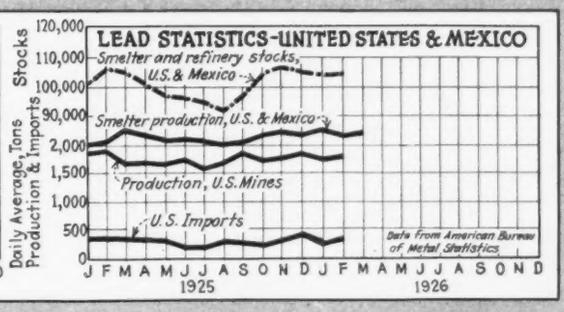

ENGINEERING & MINING JOURNAL'S WEIGHTED INDEX OF NON-FERROUS METAL PRICES
100 is Composite of Years 1922-1923-1924
Copper - Lead - Silver - Zinc - Aluminum - Tin - Nickel
1925
1926




E. & M.J. WEIGHTED INDEX OF NON-METALLIC MINERAL PRICES
100 is Monthly Average for 1924
Phosphate-Asbestos-Talc-Borax - Fullers Earth-Fluorspar-Feldspar-Barytes-Magnesite
1925
1926






LEAD STATISTICS - UNITED STATES & MEXICO
Stocks
Smelter and refinery stocks, U.S. & Mexico
Daily Average, Tons Production & Imports
Smelter production, U.S. & Mexico
Production, U.S. Mines
U.S. Imports
Data from American Bureau of Metal Statistics
1925
1926

Mining Stocks—Week Ended May 8, 1926

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	48⅛	45	45⅛	Ap.17, My.24	0.75
Arcadian Consol.	Boston	*75	*70	*75		
Ariz. Com'l.	Boston	10⅛	9⅛	9⅝	Jy.21, Jy. 31 SA	0.50
Calaveras	N. Y. Curb	1⅛	1⅛	1⅛		
Calumet & Arizona	New York	60⅛	58⅛	58⅛	Mr.5, Mr.21 QX	1.50
Calumet & Hecla	Boston	14⅛	14⅛	14⅛	Nov.30, De.15 Q	0.50
Cerro de Pasco	New York	64	62⅜	62⅞	Ap. 15, My. 1, Q	1.00
Chile Copper	New York	33⅛	31⅛	32⅛	Jn.2, Jn.28, Q	0.62½
Chino	New York	...	...	21	Sept., 1920	0.37½
Con. Coppermines	N. Y. Curb	3⅛	2⅞	3		
Copper Range	Boston	15	14	14	May, 1925	1.00
Crystal Copper	Boston Curb	*33	*30	*31		
East Butte	Boston	3⅛	3	3⅛	Dec., 1919	0.50
First National	Boston Curb	*17	*16	*16	Feb., 1919	0.15
Franklin	Boston	*50	*50	*50		
Granby Consol.	New York	20⅛	18⅛	18⅛	May, 1919	1.25
Greene-Cananea	New York	10⅞	10	10	Nov., 1920	0.50
Hancock	Boston	...	...	*50		
Howe Sound	New York	31⅛	30⅛	31⅛	Ap.1, Ap.15	0.75
Inspiration Consl.	New York	24	22⅛	23	Mar.18, Ap.5, Q	0.50
Iron Cap	Boston Curb	3⅜	3⅛	3⅜	May, 1923	0.15
Isle Royale	Boston	10⅛	9⅝	10	No.30, De.5	1.00
Jerome Verde Dev.	N. Y. Curb	*75	*75	*75		
Kennecott	New York	53⅛	52⅛	52⅛	Ma.5, Ap.15 Q	1.00
Lake Copper	Boston	1	1	1	June, 1925	0.50
Magma Copper	New York	38	36⅛	36⅝	Mh.31, Ap.15, Q	0.75
Mason Valley	N. Y. Curb	1⅞	1⅞	1⅞		
Mass Consolidated	Boston	*26	*25	*26	Nov., 1917	1.00
Miami Copper	New York	12	11⅞	11⅞	My.1, My.15 Q	0.25
Mohawk	Boston	32	31	31⅛	My.1, Je.1 Q	1.00
Mother Lode Coa.	New York	6⅛	6⅛	6⅛	De. 11, De. 31	0.37½
Nevada Consol.	New York	12⅞	12⅛	12⅛	Mh.18, Mh.31 Q	0.25
New Cornelia	Boston	20⅛	19⅞	19⅞	My.7, M.24 Q	0.40
North Butte	Boston	2⅛	2⅛	2 1/16	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*63	*55	*62	No. 14, De. 2	0.05
Old Dominion	Boston	16⅛	15	15	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†127	†122	...	Mar.20, Apr.20	Q 1.00
Quincy	Boston	19	19	19	Mar., 1920	1.00
Ray Consolidated	New York	12⅞	12⅛	12⅛	Ap.20, Ap.30	0.25
Ray Hercules	N. Y. Curb	...	...	11⅛		
St. Mary's Min. Ld.	Boston	29	28⅛	28⅛	Ap.17, My.18	2.00
Seneca Copper	New York	5⅜	5⅛	5⅛		
Shannon	Boston	*50	*40	*50	Nov., 1917	0.25
Superior & Boston	Boston	*74	*45	*51		
Tenn. C. & C.	New York	12⅛	11⅜	11⅜	Fe.27, Ma.15, Q	0.25
United Verde Ex.	N. Y. Curb	28⅛	28	28	Ap.6, My.1,	0.75
Utah Copper	New York	...	...	100⅛	Mh.18, Mh.31, Q	1.25
Utah Metal & T.	Boston	2	1⅞	1⅞	Dec., 1917	0.30
Victoria	Boston	*50	*50	*50		
Walker Mining	Salt Lake	*75	*44	*53		
NICKEL-COPPER						
Internat. Nickel	New York	34⅛	32⅛	33⅛	My.11, My.31, Q	0.50
Internat. Nickel, pfd.	New York	104	104	104	Ap.15, My.1, Q	1.50
LEAD						
Gladstone M. M. Co.	Spokane	*32½	*31½	*31½	Ja. 1, Ja. 10 M	0.0½
National Lead	New York	147½	145	146½	Ma.12, Ma.31 Q	2.00
National Lead pfd.	New York	...	...	117⅛	My.21, Je.15 Q	1.75
St. Joseph Lead	New York	38⅛	37⅛	37⅛	Je.10, Je. 21 QX	0.75
ZINC						
Am. Z. L. & S.	New York	7⅛	7⅛	7⅛	May., 1920	1.00
Am. Z. L. & S, pfd.	New York	30⅞	29	29	Nov., 1920	1.50
Butte C. & Z.	New York	5	4⅞	5	De.10, De.24	0.50
Butte & Superior	New York	12⅜	12⅛	12⅛	Ma.15, Ma.31 Q	0.50
Callahan Zn-Ld.	New York	1⅛	1⅛	1⅛	Dec., 1920	0.50
Eagle Picher	Cincinnati	28⅛	27⅞	28	My. 15, Jn.1	0.40
Eagle Picher, pfd.	Cincinnati	...	...	110	Mh.31, Ap.15 Q	1.50
New Jersey Zn.	N. Y. Curb	...	...	208	Ap.2d, My.10 Q	2.00
United Zinc	N. Y. Curb	...	...	*70		
Yellow Pine	Los Angeles	*26	*26	*26	De.8, De.18 Q	0.04
GOLD						
Alaska Juneau	New York	1⅛	1⅛	1⅛		
Argonaut	Toronto	*25	*20	*21		
Barry-Hollinger	Toronto	*37	*35	*35		
Carson Hill	Boston	...	...	*35		
Consol. W. Dome L.	Toronto	*17⅛	*14	*16⅛		
Cresson Consol. G.	N. Y. Curb	2⅛	2⅛	2⅛	Mh.31, Ap.10	0.10
Crown Reserve	Toronto	*13	*10	*11	Jan., 1917	0.05
Dome Mines	New York	14⅛	12⅞	13⅞	Mh.31, Ap.20, Q	0.50
Golden Center	N. Y. Curb	1⅞	1⅞	1⅞		
Golden Cycle	Colo. Springs	1.51	1.50	1.50	No.30, Dec.10 Q	0.03
Hollinger Consol.	Toronto	18.20	17.90	18.20	My.4, My.20	0.08
Homestake Mining	New York	54	53⅞	53⅞	My.20, My.25 M	0.50
Kirkland Lake	Toronto	1.15	1.02	1.12		
Lake Shore	Toronto	10.20	10.00	10.10	Ma.1, Ma.15 Q	0.10
McIntyre-Poreupine	New York	25⅛	25⅛	25⅛	My.1, Je.1	0.25
Newray	Toronto	...	...	*35		
Night Hawk Pen.	Toronto	*6½	*5½	*5½		
Noranda	N. Y. Curb	16⅜	14⅞	15⅞		
Portland	Colo. Springs	†*52½	†*50	...	Apr.6, Apr.15	0.02
Rand Mines	New York	...	...	32⅛	Fe.16, Fe.26	1.52
Teck-Hughes	Toronto	3.37	3.17	3.23	Ja. 15, Fe. 1	0.05
Tom Reed	Los Angeles	...	...	*75	Ma.10 Ma.20	0.02
Tough-Oakes	Toronto	*43¼	*37	*43½		
United Eastern	N. Y. Curb	...	...	*38	July, 1924	0.05
Vipond Cons.	Toronto	1.64	1.48	1.59		
Wright-Hargreaves	Toronto	8.00	7.75	7.95	Mh.15, Ap.1	IQX 0.07½
Yukon-Alaska Trust	N. Y. Curb	...	...	21⅛		
GOLD AND SILVER						
Carnegie Metals	Boston	...	...	17⅛		
Con. Cortez	N. Y. Curb	*5	*5	*5		
Con. Virginia	San Francisco	*9⅛	*8⅛	*8⅛		
Continental Mines	N. Y. Curb	...	...	*45		
Dolores Esperanza	N. Y. Curb	...	...	*50	July, 1923	0.05
Premier Gold	N. Y. Curb	2⅛	2 3/16	2⅛	Mh.19, Apr.3	Q 0.08
Tonopah Belmont	N. Y. Curb	...	...	2⅛	Se.15, Oc.1	0.05
Tonopah Extension	N. Y. Curb	*65	*38	*65	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	....	....	5⅛	Ap.7, Ap.21 Q	0.07½
Unity Gold	N. Y. Curb	...	...	*20		
West End Consol.	N. Y. Curb	*25	*25	*25	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	...	...	*45	June, 1918	0.02

Stock	Exch.	High	Low	Last		Last Div.
SILVER						
Alvarado	N. Y. Curb	...	...	1	Oct., 1920	0.50
Beaver Consol.	Toronto	*78	*71	*75	May. 1920	0.03
Castle-Trethewey	Toronto	1.44	1.35	1.42		
Coniagas	Toronto	....	....	3.75	May, 1924	0.12½
Keeley	Toronto	1.53	1.45	1.53	Ma.1, Ma.15	X 0.12
Kerr Lake	N. Y. Curb	1⅛	1⅛	1⅛	Ap.1, Ap.15	0.12½
La Rose	Toronto	*12	*11	*11	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	...	...	*85	Jy. 2, Jy. 15	0.05
McKinley-Dar.-Sav.	Toronto	*18	*17	*18	Oct., 1920	0.03
Mining Corp. Can.	Toronto	3.51	3.14	3.43	Ja. 16, Ja.30	0.12½
Nipissing	N. Y. Curb	5⅛	5⅛	5⅛	Mh.31, Ap.20, Q	0.15
Temiskaming	Toronto	*11	*11	*11	Jan., 1920	0.40
SILVER-LEAD						
Ahumada	New York			8	Mh.8, Ap.5, Q	X 0.25
Alta Merger	Salt Lake	†*5½	†*2½	...		
Bingham Mines	Boston	32⅛	31	31	Ma.20, Ma.31	Q 1.00
Cardiff M. & M.	Salt Lake	...	...	*51	De.16, No.18	0.10
Chief Consol.	Salt Lake	3.00	2.97½	2.97½	Ap.1, My.1	Q 0.10
Emma Silver	Salt Lake	†1	†*25	...		
Erupcion	Boston Curb	1 1/16	1 1/16	1 1/16	Mh.18, Ap.5, X	0.10
Federal M. & S.	New York	70	69	70		
Federal M. & S., pfd.	New York	75	73	73	No.25, De.15	Q 1.75
Hawthorne Mines	N. Y. Curb	*18	*14	*18		
Hecla Mining	N. Y. Curb	17	17	17	My.15, Je.15	Q 0.50
Iron King Mining	Salt Lake	*27	*27	*27		
Keystone Mining	Salt Lake	*45	*45	*45	Au.12, Au.26	0.07½
Lucky Jim	Spokane	*14⅛	*13⅛	*14		
Mammoth Mining	Salt Lake	2.85	2.82½	2.85	Mar.24, Apr. 1	0.10
Marsh Mines	Spokane	*4⅛	*3⅛	*3⅛	Se.15, Oc.1	0.15
Park Utah	Salt Lake	6.05	5.95	5.95	Mh.15, Ap.1	0.15
Prince Cons	Salt Lake	*4	*4	*4		
Silver King Coal	Salt Lake	8.10	7.70	8.00	Mh.20, Ap.1, Q	0.25
Silversmith	Spokane	*49⅛	*48	*48⅛	Apr.1, Apr.10	0.02
Tamarack-Custer	Spokane	*46	*44	*46	Sept., 1924	0.25
Tintic Standard	Salt Lake	13.09	12.12½	12.87½	Mh.1, Mh.20, QX	0.40
Utah-Apex	Boston	8⅛	8⅛	8⅛	Apr. 9, Apr. 15	0.25
Western Utah Copper	N. Y. Curb	...	...	*8		
IRON						
Bethlehem Steel	New York	40	38⅛	39	July, 1924	1.25
Colorado Fuel & Iron	New York	39⅛	32⅛	37⅜	May, 1921	0.75
Gt. North'n Iron Ore	New York	21⅛	21	21	De. 4, De. 28,	0.75
Inland Steel	New York	37⅛	37	37	My.10, Je.1	Q 0.75
Mesabi Iron	N. Y. Curb	....	....	1⅜		
Replogle Steel	New York	9½	9⅛	9⅛		
Republic I. & S.	New York	49	47⅛	48⅛	May, 1921	1.50
Republic I. & S. pfd.	New York	...	...	94⅛	Ma.15, Ap.1, Q	1.75
Sloss-Sheffield S. & I.	New York	121	111⅛	117⅛	Ma.10, Ma.20	Q 1.50
Sloss-Shef. S.&I. pfd.	New York	....	....	104	Ma.20, Ap.1, Q	1.75
U. S. Steel	New York	123	120	121⅛	Je.2, Je.29	Q 1.75
U. S. Steel pfd.	New York	128	126⅛	127	My.4, My.29, Q	1.75
Virginia I. C. & C.	New York	....	....	45	Jan., 1924	1.50
Virginia I.C.&C.pfd	New York	....	....	73⅛	De.15, Ja.2,	2.50
ALUMINUM						
Alum. Co. of Amer.	Open Market	64	63	63		
Alum. Co. of Amer pf.	Open Market	99⅞	99⅞	99⅞	April, Q	1.50
VANADIUM						
Vanadium Corp.	New York	35	32⅛	32⅛	My.1, My.15, Q	0.75
ASBESTOS						
Asbestos Corp.	Montreal	103	100	100⅛	De.31, Ja.15 Q	1.50
Asbestos Corp., pfd.	Montreal	124	124	124	De.31, Ja.15, Q	1.50
SULPHUR						
Freeport Texas	New York	32⅛	29	30⅞	Nov., 1919	1.00
Texas Gulf	New York	134⅜	131⅞	132⅜	Ma.1, Ma.15, Q	2.50
DIAMONDS						
De Beers Consol.	New York	...	...	27⅜	Ja.26, Fe.2	0.23
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	4⅛	4⅛	4⅛		
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	50¼	49⅜	50⅛	My.20, Je.1, Q	1.00
Amer. Metal pfd.	New York	...	...	113⅛	My.20, Je.1 Q	1.75
Amer. Sm. & Ref.	New York	118⅜	114⅜	116⅜	Ap.16, My.1, Q	1.75
Amer. Sm.&Ref.pfd.	New York	....	....	116⅜	My.7, Je.1, Q	1.75
Consol. M. & S.	N. Y. Curb	...	...	208	De.31, Ja.15	0.75
Federated Metals	N. Y. Curb	....	....	17		
Newmont Mining	N. Y. Curb	52⅛	52⅛	52⅛	Mar.31, Apr.15,	0.60
Southwest Metals	N. Y. Curb	....	....	2		
U. S. Sm. R. & M.	New York	39⅜	37⅛	37⅛	Ap.8, Ap.15, Q	0.87½
U. S. Sm. R.&M.pfd.	New York	48⅜	48⅜	48⅜	Ap.8, Ap.15, Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Henry Sachs, Colorado Springs, Colo.

PRICE WEEK ENDED APRIL 27th, 1926

Name	High	Low	Last	Last Divd. Date	Amount
Aramayo Mines (25 frs.)	82/6	81/—	82/6	May. 1926	5 p.c.†
British Platinum (£1)	6/4½	6/—	6/—	Feb. 1925	2½ p.c.
Burma Corpn. (10 rupees)	15/4½	14/10½	15/3	Feb. 1926	6 annas*
Bwana M'Kubwa (5s)	7/7½	7/3	7/4½		
Camp Bird (£1)	4/9	4/3	4/9		
El Oro (£1)	6/3	5/6	6/3	Nov. 1924	2½ p.c.*
Esperanza (10s)	1/6	1/3	1/3		
Frontino & Bolivia (£1)	8/6	8/3	8/6	Jan. 1926	1½ p.c.
Mexican Corpn. (£1)	16/—	15/6	16/—		
Mexico Mines of El Oro (£1)	30/6	30/—	30/—	Dec. 1925	12½ p.c.*
Oroville Dredging (£1)	3/9	3/6	3/9	Dec. 1923	3½ p.c.
Ouro Preto (£1)	2/6	2/—	2/6	May 1925	2½ p.c.
Rhodesian Congo Border	....	....	111/3		
St. John del Rey (£1)	9/4½	8/6	8/6	June 1925	6½ p.c.
San Francisco Mines (10s)	28/6	26/7½	28/3	Jan. 1926	22½ p.c.
Santa Gertrudis (£1)	19/10½	18/7½	19/9	July 1920	5 p.c.
Selukwe (2s. 6d.)	11/9	11/1½	11/1½	April 1917	6¼ p.c.
S. Amer. Copper (2s.)	4/10½	4/7½	4/9	Nov. 1917	75 p.c.
Tanganyika (£1)	41/—	36/3	40/—	Sept. 1925	5 p.c.
Tomboy (£1)	3/9	3/6	3/6	Jan. 1926	5 p.c.
Union Miniere du Haut-Katanga (Brussels)	6.000	5.875	5.950	July 1925	150 frs.‡

* Free of British income tax. † Swiss frs. ‡ Belgian frs.